Approved per signature page

SERVICE MODULE

ORLAN OPERATIONS
(Orlan Ops)

SM

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Revision Log

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INTRODUCTION

These crew procedures “Orlan Operations” contain information on Orlan-M Space Suit and Orlan Interface Unit operation.

These crew procedures are intended for trained crew members who have completed the full training course and simulations.

These crew procedures may be updated pending systems modification and procedure validation at simulators and training facilities.

Duration of operations is approximate.

LIST OF USED ABBREVIATIONS AND ACRONYMS

cb	circuit breaker
cnctr	connector
EVA	Extravehicular Activity
LED	Light-Emitting Diode
МСС-М	Mission Control Center - Moscow
pb	pushbutton
sw	switch
ЗВУК	acknowledge audio alarm from ПОВ or ПО-4
АСУ	toilet
АФУ	antenna feeder unit
БК-3	oxygen tank
БК-3(1-4)	onboard oxygen tanks
БНП	portable repress tank
БОС	Degassing pump unit
БРТА	Orlan telemetry unit
БСС	Orlan interface unit
ВС	moisture collector
ЗИП	spares kit
ИД	ПОВ pressure indicator
ИК	CO_2 measurement unit
ИНЖ	injector
КВД	pressure equalization valve
КВО	liquid cooling garment
КСД	depress valve
ЛП	LiOH canister
МВ	pressure gauge
МН	pressure gauge
ПГПУ	Orlan pneumohydraulic control panel
ПКО-М	Orlan testing unit
ПО-4	Orlan electrical control panel
ПОВ	EVA support panel
ПРБ	accessory
ПРК-3А	oxygen testing assembly

ПрКл	safety valve
ПхО	transfer compartment
РБС	power outlet
РО	working compartment
ТОУ	thermoelectric cooling device
Т/Х	temperature control handle on ПГПУ
УДСК	Orlan pressure gauge
УСЭ	Orlan-M ORU kit
ФОР	feedwater line filter

Р.БНП(ИД)	portable repressurization tank pressure measured by ПОВ pressure indicator (ИД)
$Р.О_2$	$О_2$ pressure in Orlan tank
Р.ПхО(МВ)	ПхО pressure measured by pressure gauge (МВ)
Р.РО(ИД)	[РО] pressure measured by ПОВ pressure indicator (ИД)
Р.СК	Orlan pressure measured by Orlan pressure gauge (kg/cm^2)
ΔР.СК (00:00:30)	Orlan pressure delta measured over 30 sec
ΔР.СК (00:01:00)	Orlan pressure delta measured over 1 min

SYMBOLS

□	illuminated
▪	blinking
■	not illuminated
▪ ИНЖ	possible false alarm
√	check (in case of discrepancy, attempt a corrective action one time only)
	verify
	continuously monitor
	verify aurally
→	place physical device in designated state
→|←	connect
←|→	disconnect
	press pushbutton
	press pushbutton to lock
	press pushbutton to release
	sw → On (i.e. up relative to label on panel)
	sw → Off (i.e. down relative to label on panel)
	rotate clockwise
	rotate counterclockwise
	rotate clockwise to stop
	rotate counterclockwise to stop
	adjust by rotating

********* ORLAN OPS 2.3.3	an anticipated off-nominal situation, if the condition left of the asterisks on the same line is not met, proceed per indicated reference
**********	an anticipated off-nominal situation, if the condition left of the asterisks on the same line is not met, perform action(s) enclosed by asterisk lines
**********	
O_2 flow selector → ИНЖ	
**********	
PRESS	Position of БСС knob

1. GENERAL INFORMATION

In these crew procedures pressure unit of mmHg is indicated for briefness as mm, pressure unit of kgf/cm^2 is not indicated.

1.1. CREW RESPONSIBILITIES

While performing operations, the crew is responsible for the following actions:

1. Perform operations per these crew procedures and **MCC-M** instructions in accordance with the crew functional responsibilities and current status of the onboard systems.
2. **Report** completed operations **to MCC-M**.
3. Monitor systems operations per these crew procedures and **MCC-M** instructions.
4. When a deviation from nominal systems operation is detected, crew must:

– record malfunction (deviation) detection time;
– make a description of detected malfunction (deviation) in writing
– report detected malfunction (deviation) to MCC-M during earliest available comm pass.

5. Upon detection of an off-nominal situation, listed in these crew procedures, perform independent troubleshooting actions recommended in the crew procedures.
6. Check nominal operation of all indicators on the control panels to be used.
7. Output commands from control panels using pushbuttons (w/o lockout feature) by pressing and holding them for 1—2 seconds.
8. Record time used to perform operations.
9. When working with hardware (control panels) equipped with protective caps or covers:
   - remove caps and covers before operations;
   - re-install caps and covers after operations.

1.2. SAFETY PRECAUTIONS

During Orlan operation, take extreme care so as not to damage any glass parts, visor, control handles, front side of ПО-4 control panel, or anything containing glass-enclosed instruments.

Observe safety precautions when working with backpack tension line, Orlan external cables, and БСС hoses. Avoid mechanical actions that may cause their kinking, over-extension, etc. Avoid sudden movements that may result in hitting station hardware.

When working with Orlan oxygen equipment and Orlan fluid connector, it is necessary to keep all devices, tubing, БК-3 pressure reducers and others clean. If necessary, use **lubricant** from ЗИП-1 kit.

EV crew wears **only** Orlan-certified accessories, all other items should be doffed prior to donning Orlan.

When issuing commands to open (close) КСД and КВД from ПОВ, confirm the command execution by monitoring ПхО pressure change (as seen on the pressure gauge).
If the pressure reading does not change, open (close) the valve manually.

The crew may operate the valves either from the ПОВ, or manually (crew preference).

False activation of the **ВЕНТ МАЛ** alarm may occur if humidity inside the Orlan is abnormally high.

Before mating the fluid umbilical connector, check the condition of O-rings of Orlan fluid connector [ОРК] (ventilation valves) and that of O-rings of fluid umbilical connector (water valves). If there are traces of water on Orlan fluid connector or fluid umbilical connector surface, remove using a clean wipe. If leakage is detected, **report to MCC-M.**

Restart Orlan fans and pumps only after they have completely stopped.

Change position of switch ПИТАНИЕ only after switches О.НАС (primary pump), Р.НАС (reserve pump), О.ВЕНТ (primary fan), Р.ВЕНТ (reserve fan) have been set to off.

Orlan leak check is performed by monitoring the position of the red arrow on Orlan pressure gauge (УДСК).

If pressure drop because of leak is abnormaly great, **repeat** the seal check.

Do not open Orlan backpack when positive pressure delta exceeds 0.05 (if it is necessary to completely equalize Orlan pressure with the ambient pressure, use the Connector to ss depressurization from ЗИП-1 kit).

2. ORLAN SETUP FOR TRAINING AND EVA

2.1. ORLAN ACTIVATION AND VISUAL INSPECTION

1. Prepare ЗИП-1 kit
   Secure Orlan using Orlan restraint probe
2. Unclasp shoulder straps on both sides of Orlan stowage cover, loosen straps and unfasten hooks on lower flaps
   Unfold leg shells, remove boot covers
   Unfasten Orlan electrical umbilical cover Velcro and pull out X6K connector
   Unbuckle side flap, loosen strap, and unfasten hooks
   Unbuckle arm pockets, loosen straps and take out arms
   Remove stowage cover and helmet cover, secure they in airlock temporarily
3. Prior to the **first use** of Orlan
   Discard foam-rubber packing:
   from under light filter,
   from emergency hose connector,
   from safety tether hooks,
   from safety tether attachment point

ПГПУ 4. √ O_2 flow selector — ИНЖ
√ БАЛЛОН — РЕЗ
√ РЕГУЛЯТОР — ОСН

ПО-4 √ О.НАС, О.ВЕНТ, Р.ВЕНТ, ПИТАНИЕ — БОРТ, Р.НАС
Open backpack and secure using ПРБ-11 accessory
Retrieve personal gear bag from Orlan, liquid cooling garment ←┤→ Orlan

5. Prior to the **first use** of Orlan
   INSTALLATION OF ORLAN PRESSURE GAUGE ON ORLAN CASING:
   Unstow Orlan pressure gauge from personal gear bag
   Remove caps from Orlan pressure gauge bayonet connector and socket on Orlan casing and stow them in ЗИП-1 kit
   Orlan pressure gauge fitting →|← Orlan bracket socket
   √ Bayonet connector is secured
   √ Protective rubber cap is installed on Orlan pressure gauge
6. Carefully straighten Orlan arms and other soft shells
   ◅ (looking from inside Orlan) sun filter light-reflecting coating is not damaged
   Visually inspect and feel for moisture in Orlan internal soft shells and whether Orlan drying is needed
   Focus particular attention on boot soles and condition of vent ducts (tubes in legs and arms)
   Open backpack internal cover
   ◅ Internal components and tubes in backpack are not damaged
   Write reserve БК-3 serial number in table
   in Orlan 1 = _____ in Orlan 2 = _____
7. Prior to the **first use** of Orlan
   Remove wrapping from water tank connector, backpack connector and backpack tubing restraint lock
   Discard removed wrapping in trash

8. Place X6K electrical umbilical connector and Orlan emergency hose connector in outer lining pocket
   Unstow liquid cooling garment from personal gear bag
   ◅ liquid cooling garment tubes have no bends and/or breaks
   Liquid cooling garment →|← Orlan
   Stow liquid cooling garment into Orlan
   Close backpack internal cover
   Remove ПРБ-11 and stow in ЗИП-1 kit
   Backpack tension line ring → on hook (do not close handle)
   Stow stowage cover and helmet cover into personal gear bag
9. **Report to MCC-M** the results of Orlan visual inspection and activation, and also the number of Orlan reserve БК-3 tank

2.2. БСС CHECKOUT

1. ◅ Fluid umbilical connectors →|← onboard caps
   Fluid umbilical connectors ←|→ onboard caps
   ◅ Fluid umbilical connectors, tubes and harness connector are not damaged
   Secure portable fluid umbilical connector caps on handrail using Velcro
2. √ Correct connection of hose harness and emergency oxygen hose to БСС (marks and labeling should match)
   √ БСС O_2 tubing →|← onboard БК-3 or metal caps
   √ one БСС O_2 tubing connector →|← rubber cap
   √ БСС water hoses (four) →|← onboard heat exchanger hoses
   √ ХБСС electrical connector →|← pigtail from 3.0 m electrical umbilical
3. Prior to the **first** EVA from airlock
   tether connectors to ss depressurization (two) and special wrench БК-3 (from ЗИП-1 kit) to БСС so that wire length allows depressurization connector to reach Orlan fluid connector, and it allows special wrench to reach the valves of all onboard БК-3, connected to БСС

   During subsequent EVAs:
   √ Depressurization connectors (two) and special wrench are tethered to БСС

БСС 4. O_2 CLOSED
   Verify БСС knob can be switched and secured in all 7 positions
   O_2 CLOSED

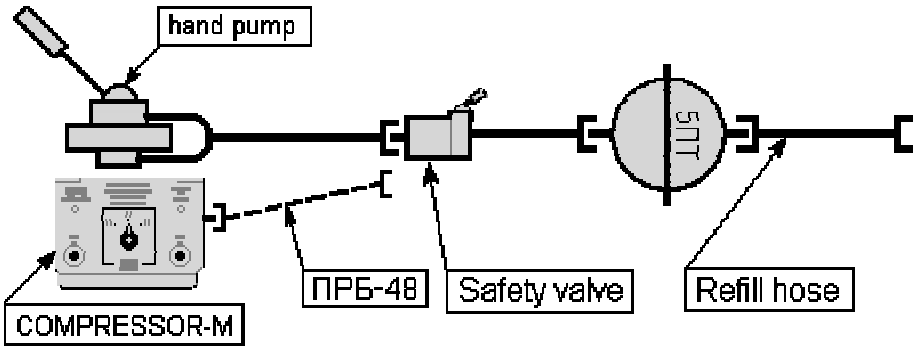
2.3. ORLAN WATER SYSTEMS GAS/WATER SEPARATION

2.3.1. REFILL SYSTEM PREPARATION

(00:30:00)

Perform ПРБ-48 accessory and refill hose from ЗИП-5 kit
Configure refilling circuit:

NOTE
The crew may use the hand pump and the safety valve from СВО-3В



If COMPRESSOR-M is used for refilling
COMPRESSOR-M →|← cable АР-7141-4120 (from ЗИП-5)→|← РБС 10/3
sw PRESSURE SELECTION → 0.5

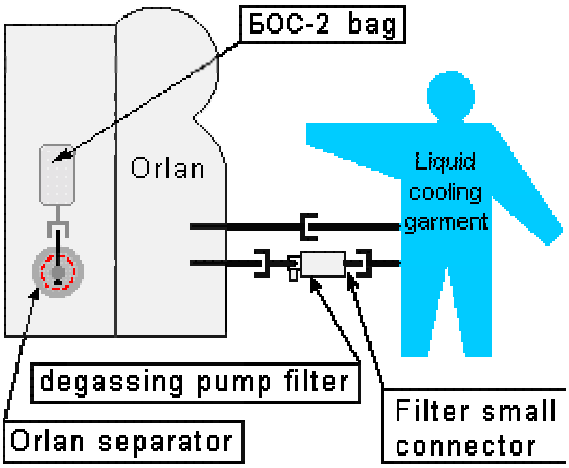
2.3.2. ORLAN PREPARATION FOR SEPARATION

(00:20:00)

ORU kit 1. Unstow degassing pump filter (√**MCC-M** for filter serial number)

ЗИП-1 kit Unstow БОС-2 bag
Liquid cooling garment and БОС-2 bag →|← Orlan (see fig.)

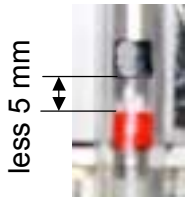
2. Open backpack and backpack internal cover
√ Water bladder ←|→ backpack water connector
Release tubing restraint in backpack (to the right on the sublimator)
Move tubing restraint aside to allow access to gas/water separator relief valve
Place БОС-2 bag on gas/water separator degas fitting



ПО-4 3. √ О.НАС, О.ВЕНТ, Р.ВЕНТ, ПИТАНИЕ — БОРТ, Р.НАС
√ all pb
Electrical umbilical →|← Orlan
Stow caps with Х6К electrical connector and Orlan fluid connector into ЗИП-1 kit

2.3.3. ORLAN WATER COOLING SYSTEM REFILLING

1. When refilling water cooling system during separation:
   | √ Refill hose →|← degassing pump filter
   When refilling water cooling system without separation:
   | one of liquid cooling garment connectors ←|→ Orlan
   | refill hose →|← one of released connectors



Safety valve 2. √ Handle — OTKP
Operate hand pump until safety valve activates ( )
√ Clearance between red fill indicator and black mark < 5 mm

****

◅ No visible leak from water cooling system
◅ No air bubbles in separator
Proceed with procedure
◅◅ Flow rate in water cooling system > 1.5 l/min
Report to MCC-M

****

3. Refill hose ←|→ degassing pump filter

2.3.4. GAS/WATER SEPARATOR GAS REMOVAL

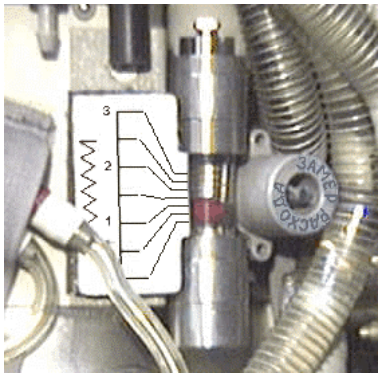
1. √ Refill hose ←|→ degassing pump filter
backpack √ БОС-2 bag →|← degas fitting
ПО-4 √ O.HAC (P.HAC)

NOTE
Do not allow gas volume in the separator larger than the red dotted circle

backpack 2. ◅◅ Water system fill indicator position — normal ********** 2.3.3.
Turn the relief valve until the degas fitting enters the gas bubble
Press relief valve and release gas bubble
Do not allow more than ~3 ml of water to enter the bag
When degassing complete, БОС-2 bag ←|→ degas fitting
Empty gas/water in АСУ

2.3.5. WATER FLOW RATE MEASUREMENT

ЗИП-1 Unstow special screwdriver
ПГПУ Temperature control handle → 6 (TO — OTKЛ)
ПО-4 √ O.HAC (P.HAC)
backpack Using special screwdriver ↓ ЗАМЕР РАСХОДА and hold
Determine water flow rate by indicator ball position (see Fig on indicator scale)
pb ЗАМЕР РАСХОДА → Release

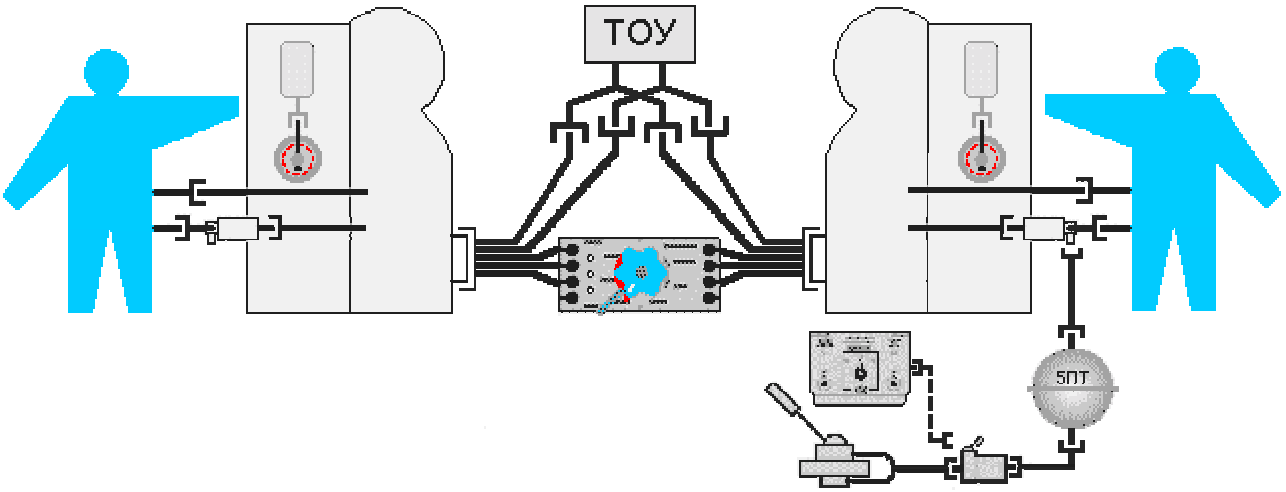


2.3.6. SIMULTANEOUS ORLAN AND БСС WATER SYSTEMS GAS/WATER SEPARATION

(01:00:00)

1. Perform Refill System Preparation per 2.3.1 and
   Orlan Preparation For Separation per 2.3.2 for two Orlans
   √ Fluid umbilical water hoses →|← onboard heat exchanger hoses

БСС O2 CLOSED
Fluid umbilical →|← Orlan



2. √ Water system fill indicator position — normal ********** 2.3.3
   √ Refill hose ↔ degassing pump filter

ПГПУ √ ТО — ОТКЛ
Temperature control handle → 6 (full down)

ПОВ ↓ PANEL ON (□ LED)
↓ SUIT 1,2 ON (□ LED)

ПО-4 √ ПИТАНИЕ — БОРТ ■ УТЕЧ, ВЕНТ МАЛ, ИНЖ, **ЗВУК**
O.HAC, P.HAC

backpack ↓ ЗАМЕР РАСХОДА ◁ initial flow rate record in Table
Remove gas bubbles from separators (see 2.3.4 step 2)
◁◁ Degassing pump filters are clear (if they are dark — replace)
◁◁ water flow rate > 1.5 liter/min **********

****
O.HAC, P.HAC (for 5---10 sec)
O.HAC, P.HAC
◁ flow rate is > 1.5 liter/min
****

Table

Results	Orlan-1	Orlan-2
initial flow rate		
final flow rate		

00:00:00 ◅ Gas bubble formation in separator has stopped
00:03:00 Temperature control handle → 0 (full up)
When necessary remove gas bubbles from separator (see 2.3.4)

00:00:00 3. ◅ Gas bubble formation in separator has stopped
00:03:00 Temperature control handle → 6 (full down)
↓ ЗАМЕР РАСХОДА
◅ Water flow rate > 1.5 l/min (record in Table) ********** see up
Ⓟ О.НАС, Р.НАС
Refill water system (see 2.3.3)
ПО-4 √ Ⓟ ПИТАНИЕ — БОРТ
ПОВ ↓ SUIT 1, 2 OFF (■ LED)
↓ PANEL OFF (■ LED)
ПО-4 ■ all annunciators
БОС-2 bags (two) ←|→ degas fittings
Empty gas/water into АСУ
Stow empty bags into ЗИП-1 kit
Reinstall tubing restraint in backpack
Close backpack internal covers
Degassing pump filters ←|→ from Orlan and liquid cooling garment
Liquid cooling garment →|← Orlan
Stow liquid cooling garment in Orlan
Remove ПРБ-11 and stow in ЗИП-1 kit
Backpack tension line ring → on hook
Fluid umbilicals ←|→ Orlans
Fluid umbilicals →|← onboard caps
Disassemble refill system

2.4. OPERATIONS WITH ORLAN REPLACEABLE ELEMENTS

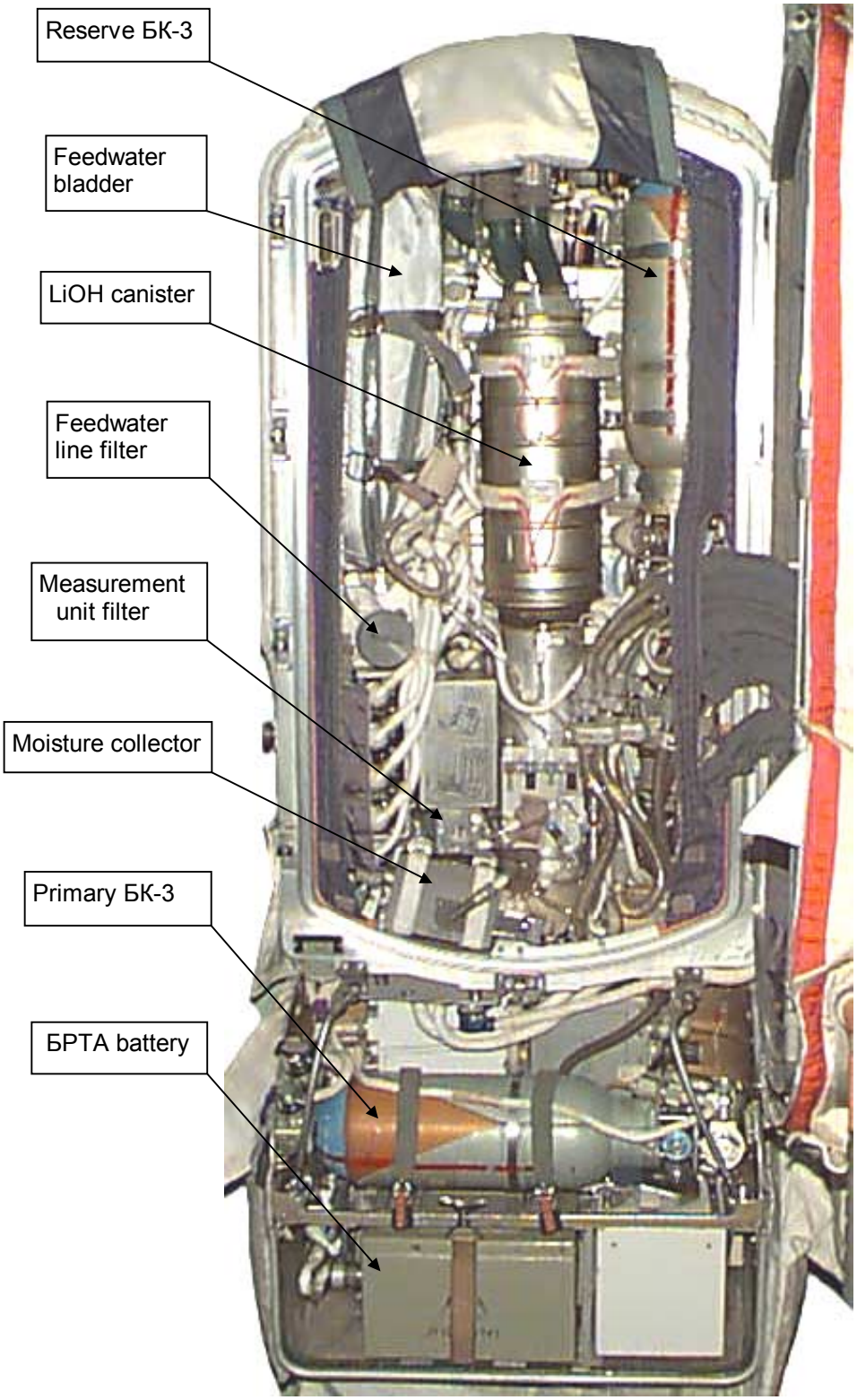


Fig. 2.4-1. Orlan-M replaceable elements.

NUMBERS OF REPLACEABLE ELEMENTS AND EQUIPMENT

EVA date		EVA #		
Name of replaceable elements	Numbers of replaceable elements			
	checks, training		EVA	
	Orlan-1	Orlan-2	Orlan-1	Orlan-2
Primary БК-3				
Reserve БК-3				
LiOH canister				
Moisture collector				
measurement unit filter				
Feedwater line filter				
Degassing pump filter				
5ПТ tank				
БРТА battery				
Liquid cooling garment				
Gloves				
Gloves (spare)				
Onboard БК-3 (1)				
Onboard БК-3 (2)				
Onboard БК-3 (3)				
Onboard БК-3 (4)				

EVA date		EVA #		
Name of replaceable elements	Numbers of replaceable elements			
	checks, training		EVA	
	Orlan-1	Orlan-2	Orlan-1	Orlan-2
Primary БК-3				
Reserve БК-3				
LiOH canister				
Moisture collector				
measurement unit filter				
Feedwater line filter				
Degassing pump filter				
5ПТ tank				
БРТА battery				
Liquid cooling garment				
Gloves				
Gloves (spare)				
Onboard БК-3 (1)				
Onboard БК-3 (2)				
Onboard БК-3 (3)				
Onboard БК-3 (4)				

EVA date		EVA #		
Name of replaceable elements	Numbers of replaceable elements			
	checks, training		EVA	
	Orlan-1	Orlan-2	Orlan-1	Orlan-2
Primary БК-3				
Reserve БК-3				
LiOH canister				
Moisture collector				
measurement unit filter				
Feedwater line filter				
Degassing pump filter				
5ПТ tank				
БРТА battery				
Liquid cooling garment				
Gloves				
Gloves (spare)				
Onboard БК-3 (1)				
Onboard БК-3 (2)				
Onboard БК-3 (3)				
Onboard БК-3 (4)				

EVA date		EVA #		
Name of replaceable elements	Numbers of replaceable elements			
	checks, training		EVA	
	Orlan-1	Orlan-2	Orlan-1	Orlan-2
Primary БК-3				
Reserve БК-3				
LiOH canister				
Moisture collector				
measurement unit filter				
Feedwater line filter				
Degassing pump filter				
5ПТ tank				
БРТА battery				
Liquid cooling garment				
Gloves				
Gloves (spare)				
Onboard БК-3 (1)				
Onboard БК-3 (2)				
Onboard БК-3 (3)				
Onboard БК-3 (4)				

EVA date		EVA #		
Name of replaceable elements	Numbers of replaceable elements			
	checks, training		EVA	
	Orlan-1	Orlan-2	Orlan-1	Orlan-2
Primary БК-3				
Reserve БК-3				
LiOH canister				
Moisture collector				
measurement unit filter				
Feedwater line filter				
Degassing pump filter				
5ПТ tank				
БРТА battery				
Liquid cooling garment				
Gloves				
Gloves (spare)				
Onboard БК-3 (1)				
Onboard БК-3 (2)				
Onboard БК-3 (3)				
Onboard БК-3 (4)				

EVA date		EVA #		
Name of replaceable elements	Numbers of replaceable elements			
	checks, training		EVA	
	Orlan-1	Orlan-2	Orlan-1	Orlan-2
Primary БК-3				
Reserve БК-3				
LiOH canister				
Moisture collector				
measurement unit filter				
Feedwater line filter				
Degassing pump filter				
5ПТ tank				
БРТА battery				
Liquid cooling garment				
Gloves				
Gloves (spare)				
Onboard БК-3 (1)				
Onboard БК-3 (2)				
Onboard БК-3 (3)				
Onboard БК-3 (4)				

2.4.1. MEASUREMENT UNIT FILTER REPLACEMENT

(00:10:00)

Open backpack and secure using ПРБ-11 accessory (ЗИП-1 kit)
Open backpack internal cover
Disconnect filter tubes
Loosen captive flag screw
Remove measurement unit filter
Unstow new measurement unit filter from Orlan-M ORU kit
Remove caps from new filter, discard
Install new measurement unit filter
Secure measurement unit filter with flag screw (without applying much force)
Flag → to secured position
√ Measurement unit filter tubes are connected as shown in decal ХРАНЕНИЕ

2.4.2. LIOH CANISTER INSTALLATION

(00:10:00)

Remove launch caps and rubber collars from new LiOH canister, stow in personal gear bag pocket
Push restraints and open tabs in lower part of LiOH canister
Insert top part of LiOH canister under valve cover, without closing locks
Align red line on LiOH canister with red mark on sublimator
Insert lower part of LiOH canister into upper inlet of sublimator and depress tabs
Turn ring on valve cover to align three wedge locks with the corresponding connectors on top of LiOH canister
√ Rubber tubes on valve cover are not twisted
Tighten locks and insert pin into lock hole
Secure LiOH canister with the two elastic straps

2.4.3. MOISTURE COLLECTOR INSTALLATION

(00:10:00)

Retrieve new moisture collector from Orlan-M ORU kit (√ **MCC-M** for serial number)
Remove transport casing from moisture collector and discard
Insert new moisture collector into socket on sublimator
Secure moisture collector with the two elastic straps using special screwdriver (from ЗИП-1 kit)
Sublimator tube bayonet connector →|← moisture collector

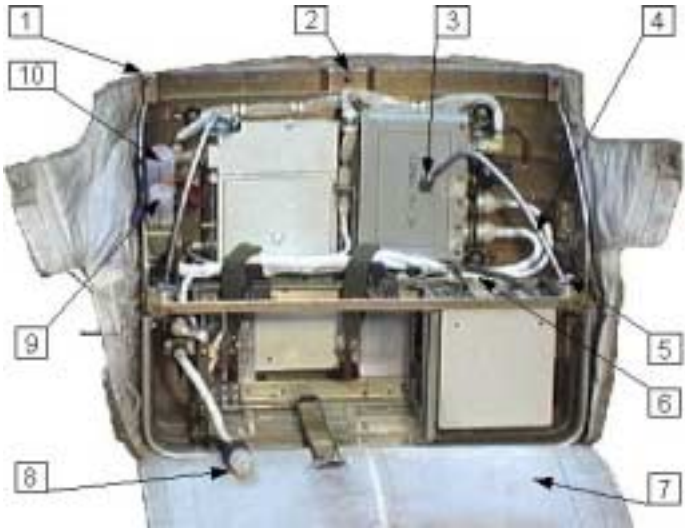
2.4.4. FEEDWATER LINE FILTER INSTALLATION IN BACKPACK

(00:10:00)

Retrieve new feedwater line filter from Orlan-M ORU kit (√ **МСС-М** for serial number)
Discard plastic cap from filter
Remove ПРБ-43 cap from feedwater line filter socket and stow into ЗИП-6 kit
Lubricate feedwater line filter O-rings with lubricant from ЗИП-1 kit (if necessary)
Insert feedwater line filter into socket, ↶

2.4.5. БРТА (ORLAN TELEMETRY UNIT) INSTALLATION ON BACKPACK

(00:20:00)



1. Guide cones (on the left and on the right)
2. Central screw
3. Right strut coupling nut
4. Right strut (for БРТА additional attachment)
5. Height adjusting nut for right strut
6. XWA3, XWA4 connectors protective casing
7. БРТА thermal blanket flap
8. X21/1 electrical connector cap
9. X109 electrical connector cap
10. X107 electrical connector cap

1. <u>БРТА PREPARATION FOR INSTALLATION</u>:
   Unfasten Velcro of БРТА cover
   Remove locking nut from БРТА central screw, stow into ЗИП-1 kit
   Remove caps from X109, X107 connectors (two)
   Secure primary БК-3 tension straps with Velcro
   √ ⏚ ОРЛАН, УСК
   ◅ БРТА for mechanical damage
   For **first** using БРТА
   ⎪ Remove wrapping from struts, discard
2. <u>ORLAN PREPARATION FOR БРТА INSTALLATION:</u>
   Open backpack and secure with ПРБ-11
   X107 connector ↤↦ primary БК-3 casing cap
   Install cap X107 (removed from БРТА) on plug of primary БК-3 casing
   Strut coupling nuts (two) ↤↦ backpack brackets
   Open multilayer insulation and loosen central screw
   Remove primary БК-3 casing from Orlan
   X109 connector ↤↦ corresponding connector in lower part of backpack
   Install X109 connector cap (removed from БРТА) on connector of backpack

ПО-4 3. √ ⏚ О.НАС, О.ВЕНТ, Р.ВЕНТ, ПИТАНИЕ — БОРТ, Р.НАС
   Insert БРТА guide cones into sockets on backpack housing
   Secure БРТА on backpack housing with central screw

4. Unfasten pocket Velcro to stow АФУ high frequency cables under Orlan hatch
   Remove caps from XWA3 and XWA4 connectors (two) and stow in ЗИП-1 kit

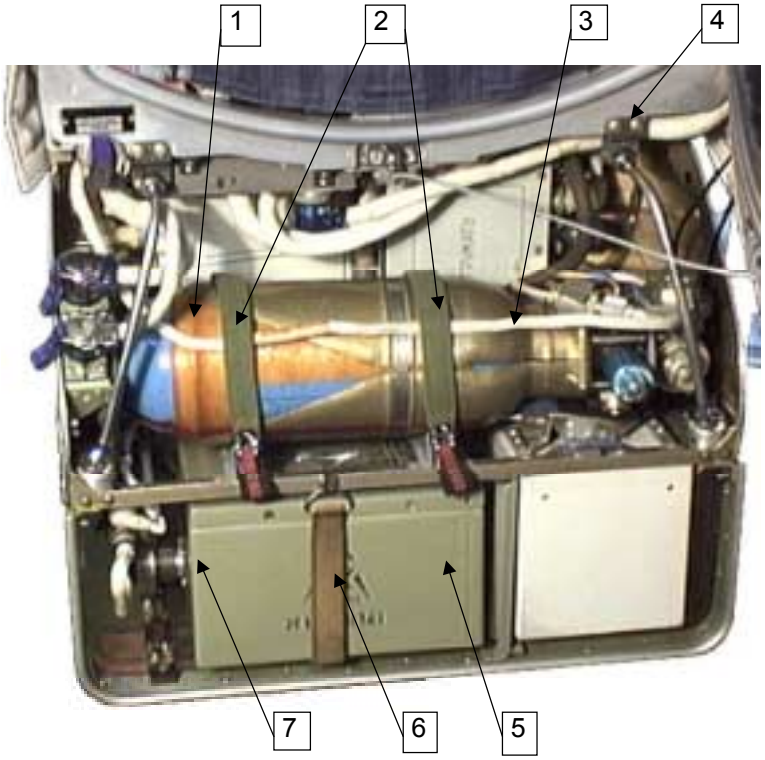
БРТА 5. Open АФУ connectors protective casing
   XWA3, XWA4 connectors (two) →|← БРТА connectors
   Stow АФУ high frequency cables per color marking on БРТА housing, secure with Velcro
   Close casing and fasten Velcro
   Fasten Velcro under Orlan hatch

6. X109, X107 backpack connectors (two) →|← corresponding БРТА connectors and secure with restraints
   БРТА left strut →|← backpack left thread bracket (adjust height by using nut on the strut base)

2.4.6. PRIMARY БК-3 INSTALLATION IN БРТА

(00:05:00)

√ БРТА right strut ←|→ backpack thread bracket
√ Caps of oxygen tube and Х3КР electrical connector are removed
√ Tension straps →|← Velcro on БРТА units
Caps (two) ←|→ primary БК-3 oxygen tube and electrical connector, discard
Oxygen tube →|← БК-3
Х3КР electrical connector →|← БК-3
Insert БК-3 into limiting plate from БРТА left side and place it into cradles on БРТА
√ Alignment of red marks on limiting plate and БК-3
√ Oxygen tube is not twisted or kinked
Insert mated electrical connector into lirka clip on БК-3 (per decal on БК-3)
Secure БК-3 with tension straps, and simultaneously insert cable from Х3 КР connector under strap (to remove slack)
БРТА right strut →|← backpack right thread bracket (adjust height by using nut on the strut base)



1. Primary БК-3
2. Tension straps
3. Х3КР electrical cable (from O_2 pressure sensor in БК-3)
4. Backpack thread bracket
5. Battery 825M1
6. Battery fastening strap
7. Х21/1 electrical connector

2.4.7. BATTERY INSTALLATION IN БРТА

(00:05:00)

БРТА 1. Remove battery rubber strap on БРТА and secure it to БРТА housing
Remove caps from battery electrical connector and БРТА X21/1 electrical connector and stow them in ЗИП-1 kit
Install auxiliary strap (stowed in БРТА) onto battery
Insert battery into БРТА
X21/1 connector →|← battery
√ Conical guides on БРТА should enter apertures on battery
Secure battery with rubber strap in БРТА
Close Velcro and snap hooks on БРТА multilayer insulation

2. ОРЛАН

ПО-4 ПИТАНИЕ → АВТ
U/ЗВУК U ≥ 27 V
СВЕТ
All bulbs in helmet lights come on **********
****
Replace helmet lights per 4.10
****

ПО-4 3. СВЕТ, ПИТАНИЕ → БОРТ
БРТА ОРЛАН, УСК
Attach БРТА multilayer insulation to backpack multilayer insulation using Velcro

2.4.8. PRIMARY БК-3 INSTALLATION IN BACKPACK (EVA WITHOUT БРТА)

1. If primary БК-3 casing →|← backpack
   БК-3 casing multilayer insulation ←|→ backpack multilayer insulation (unfasten Velcro and snap hooks)
   Loosen central captive screw on casing
   If primary БК-3 casing ←|→ backpack
   √ БРТА ←|→ Orlan
   Struts of additional restraining БК-3 casing →|← backpack thread bracket
   Open casing still attached to additional restraining struts

2. Remove rubber caps from БК-3 and from bayonet connector of backpack oxygen tube
   Oxygen tube →|← БК-3
   БК-3 electrical connector →|← backpack X3KP connector, install mated electrical connector into lirka clip on БК-3

3. √ X107 connector in lower part of backpack →|← jumper plug on БК-3 casing
   √ X109 connector →|← corresponding connector in lower part of backpack

4. Place БК-3 into casing cradles, align БК-3 valve with opening in casing
   Secure БК-3 and electrical cable (remove slack) with rubber straps
   Insert casing conical pins in backpack opening
   Secure casing on backpack with central captive screw
   БК-3 casing multilayer insulation →|← backpack multilayer insulation (fasten Velcro and snap hooks)

2.4.9. БК-3 AND BATTERY REMOVAL FROM БРТА

Open backpack and secure using ПРБ-11 accessory (ЗИП-1 kit)
Release multilayer insulation flap from БРТА
БРТА right strut ←┼→ backpack
БК-3 fastening straps ←┼→ БРТА casing
Backpack oxygen tube ←┼→ БК-3
БК-3 electrical connector ←┼→ backpack electrical connector
Remove БК-3 from the БРТА cradle
Install rubber caps (from ЗИП-1 kit) on oxygen connectors of БК-3 and backpack oxygen tube
Disconnect battery fastening strap
X21/1 connector ←┼→ battery
Caps from ЗИП-1 kit →|← БРТА and battery X21/1 electrical connectors
Pull auxiliary ring and remove battery from БРТА
Remove auxiliary ring from battery and stow ring into БРТА

2.4.10. БРТА REMOVAL FROM ORLAN BACKPACK

(00:15:00)

БРТА √ ⏚ ОРЛАН, УСК
√ Backpack is secured with ПРБ-11 accessory (ЗИП-1 kit)
√ БК-3 and battery are removed
БРТА multilayer insulation ←┼→ backpack multilayer insulation
БРТА fastening struts (two) ←┼→ backpack
X107, X109 electrical connectors (two) ←┼→ БРТА
Open АФУ connectors protective casing
Demate XWA3, XWA4 connectors (two) and cap (from ЗИП-1 kit)
Stow XWA3, XWA4 connectors into multilayer insulation pocket under Orlan hatch
Secure pocket with Velcro
Loosen central captive screw
Remove БРТА
Retrieve X107 cap from connectors of БРТА to be installed or from primary БК-3 casing connector (during preparation for EVA without БРТА)
Retrieve X109 cap from backpack bottom
Install caps on X107, X109 connectors of removed БРТА

2.4.11. LIOH CANISTER, MOISTURE COLLECTOR AND FEEDWATER LINE FILTER REMOVAL FROM ORLAN

(00:10:00)

Prepare ЗИП-1 and ЗИП-6 kits
Open backpack and secure using ПРБ-11 accessory (from ЗИП-1 kit)
Open backpack internal cover

1. LiOH CANISTER REMOVAL
   After the first use of Orlan
   Remove LiOH canister launch fasteners together with pads, discard
   Unclasp LiOH canister rubber straps (two)
   Disengage pin from wedge lock, rotate ring and open valve cover
   Pull tabs on bottom of LiOH canister and remove LiOH canister from sublimator
   Press stops and ↷ tabs in lower part of LiOH
   Install caps on LiOH canister (from personal gear bag pocket)
   Label LiOH canister “USED” (√ **MCC-M** for further usage)
   (If LiOH canister is removed after training, label it “USED DURING TRAINING” adding training date and usage time)

2. MOISTURE COLLECTOR REMOVAL
   Tube ←|→ moisture collector
   Release two moisture collector fastening straps (using screwdriver from ЗИП-1 kit)
   Remove moisture collector, discard
   ПРБ-41 accessory (from ЗИП-6 kit) →|← moisture connector socket and secure it with two straps
   Tube for connection sublimator to moisture connector → under straps
3. FEEDWATER LINE FILTER REMOVAL (only after EVA)
   Press stops, ↷ feedwater line filter and remove from socket, discard
   ПРБ-43 accessory (from ЗИП-6 kit) →|← feedwater line filter socket

2.4.12. ONBOARD БК-3 REPLACEMENT

(00:20:00)

БСС √ Onboard БК-3 valves — closed
PRESS ✣ O_2 OPEN
O_2 CLOSED
БСС O_2 tube bayonet connectors ←|→ БК-3 to be replaced
Cap connectors
Electrical connector ←|→ БК-3 to be removed
Remove БК-3 from cradle
Install new БК-3 (√ **MCC-M** for БК-3 serial number(s))
Rubber caps ←|→ from new БК-3
Rubber caps →|← onto removed БК-3
Bayonet and electrical connectors →|← БК-3 (per decal on БК-3)
Do not mate БСС oxygen tube bayonet connector (with **rubber** cap) to БК-3

ПОВ ↓ PANEL ON (□ LED)
Р.БК-3(1) (ИД) = _____ (≥ 50)
Р.БК-3(2) (ИД) = _____
Р.БК-3(3) (ИД) = _____
Р.БК-3(4) (ИД) = _____
↓ PANEL OFF (■ LED)

2.4.13. DETERMINATION OF WATER QUANTITY IN FEEDWATER BLADDER

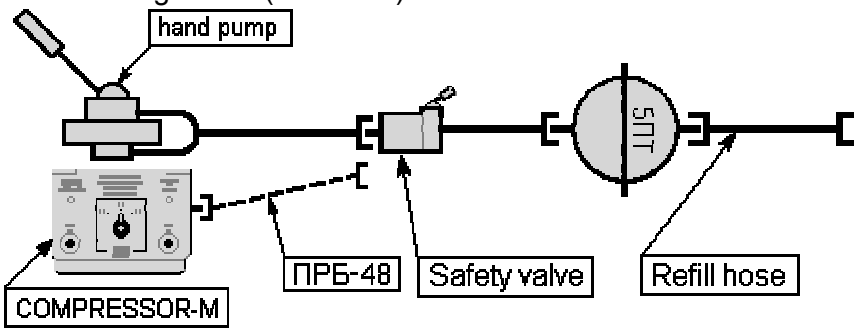
(00:10:00)

√ Backpack and internal backpack cover are opened
Unstow ПРБ-13 accessory from ЗИП-5 kit
Release fastening straps and open long zipper on feedwater bladder restraint
Unstow feedwater bladder connector from pocket on lower strap of feedwater bladder restraint
Remove feedwater bladder from restraint
Insert feedwater bladder strap into slot of ПРБ-13 accessory
Evenly and tightly roll up bladder towards fitting (while rolling, ensure that lines on both sides of bladder are aligned)
Determine water quantity using scale provided on bladder
Unroll bladder, remove ПРБ-13 accessory
Place feedwater bladder into restraint
Align feedwater bladder fitting with opening in feedwater bladder restraint
Place visible glued seam of feedwater bladder under left half of feedwater bladder restraint
√ Feedwater bladder is not twisted or kinked
Fasten long zipper and straps on feedwater bladder restraint
Stow ПРБ-13 accessory in ЗИП-5 kit

2.4.14. ORLAN FEEDWATER BLADDER REFILL

1. FEEDWATER BLADDER SETUP FOR REFILL (00:05:00)
   Unstow feedwater bladder connector from pocket on lower strap of feedwater bladder restraint
   Loosen fastening straps of feedwater bladder restraint
   Unfasten long zipper on feedwater bladder restraint
   √ Feedwater bladder is not twisted or broken
   √ Feedwater bladder fitting is aligned with opening in bladder restraint
   √ Feedwater bladder glued seam is located to the left of long zipper opening
   Fasten long zipper on feedwater bladder restraint

2. FEEDWATER BLADDER REFILL FROM ONBOARD CONTAINER (00:45:00 for two Orlans)
   Configure the refilling circuit (see 2.3.1):



   Fully close short zipper on feedwater bladder restraint
   Filling hose →|← feedwater bladder connector
   Operate hand pump until safety valve activation
   Pump five more times with 1 min intervals
   ◅ Feedwater bladder is filled (by touch)
   Filling hose ←|→ feedwater bladder
   Fully open short zipper on feedwater bladder restraint
   Tighten fastening straps of feedwater bladder restraint
   Stow water bladder connector in pocket on lower strap of feedwater bladder restraint

2.4.15. FINAL INSPECTION OF ORLAN AFTER PARTS REPLACEMENT

(00:10:00)

1. Open backpack internal cover
   √ All three wedge locks of valve cover are closed and safety pin is engaged
   √ Moisture collector tube →|← correponding connector of backpack
   √ Measurement unit tubes are in position ХРАНЕНИЕ (stowage)
   √ Feedwater line filter is installed into socket
   √ Oxygen and electrical connectors →|← primary and reserve БК-3
   √ Mating of all connectors, no bends or visible damage to tubes and hoses
   √ Feedwater bladder tube ←|→ backpack tube

БРТА

2. √ Electrical connector X21/1 →|← battery
   √ X107, X109, XWA3, XWA4 connectors (four) →|← БРТА
   √ ОРЛАН, УСК
3. ◅ Backpack rubber seal and ventilation manifolds on Orlan housing, ensure there are no debris on backpack manifold mesh screen

   Close backpack internal cover

4. ◅ Integrity of safety tether umbilical segment

ПГПУ

   √ Temperature control handle — 3
   √ ТО — ОТКЛ
   √ Orlan pressure gauge →|← Orlan

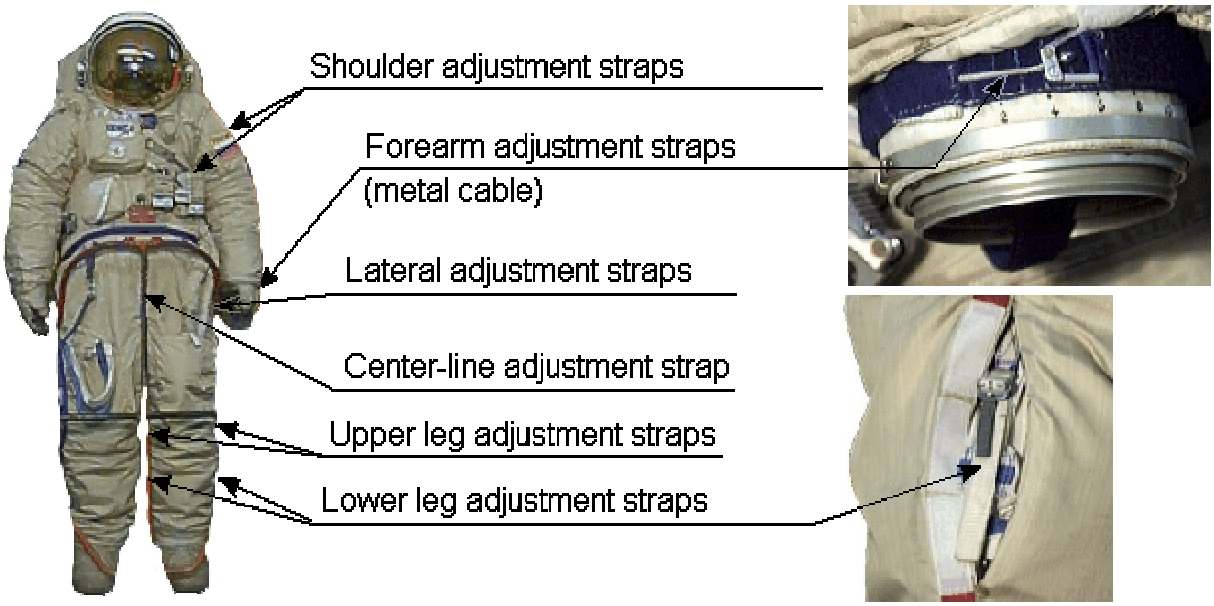
   Backpack tension line ring → on hook (**do not close** backpack sealing handle)

2.5. ORLAN SIZE ADJUSTMENT

(01:00:00)

Orlan adjustment data

Place of adjustment		EV1 Orlan		EV2 Orlan	
		exterior	interior	exterior	interior
Arm	Forearm adjustment straps				
	Shoulder adjustment straps				
Body	Lateral adjustment straps				
	Center-line adjustment straps				
Leg	Upper leg adjustment straps				
	Lower leg adjustment straps				



2.5.1. LEG SHELL ADJUSTMENT

Open flaps of Orlan leg multilayer insulation near adjustment straps
Adjust length of center-line adjustment strap and lateral straps (see Table)
Adjust upper and lower leg adjustment straps
Route straps tips through strap loops and secure them with Velcro
Close flaps of Orlan leg multilayer insulation with Velcro

2.5.2. ARM ADJUSTMENT

Open flaps of Orlan arm multilayer insulation near adjustment straps
Install metal cable buckle on arm cuff and shoulder straps (see Table)
If necessary, tighten or loosen transverse elbow cords
Close flaps of Orlan arm multilayer insulation with Velcro

2.5.3. COMM CAP ADJUSTMENT

Don comm cap (size 1 for head sizes 55---58,
size 2 for head sizes 59---62)

Adjust comm cap using cord and straps

C A U T I O N

Microphones are fragile. Adjust their position only by holding microphone bracket.

NOTE

Adjust microphone position by selecting required adjustment holes in microphone bracket, then secure microphone bracket with 2 screws.
Microphone vertical position can be varied by microphone bracket rotation. When necessary, tighten microphone bracket locking nut
Microphone horizontal position can be varied by bending microphone bracket

Place microphones at a distance of 1.0---1.5 cm from corners of mouth
On MCC-M GO, perform comm check after comm cap adjustment

2.6. EQUIPMENT SETUP

(00:20:00)

1. Retrieve personal gear bag from Orlan
   Unfasten personal gear bag Velcro
   Unstow liquid cooling garment, Orlan thermal comfort undergarment, socks, hygienic gloves, hygienic trunks from personal gear bag
   Stow hygienic gloves in pockets on housing lining inside Orlan
   Straighten liquid cooling garment with foam dummy and stow into Orlan (insert liquid cooling garment arms and legs into Orlan arms and legs)
   Liquid cooling garment connectors (two) →|← Orlan connectors
   Roll up Orlan cover-container and stow into personal gear bag

2 Remove comm cap, gloves, and mirrors from personal gear bag pocket
   Remove safety caps from arm connectors and stow into bag
   Gloves →|← Orlan
   √ Bladder or straps do not interfere with latches
   √ ~ 1 mm clearance near each of four yellow marks
   √ Lock restraints — closed
   Cover connector on each glove with protective cover (multilayer insulation)

3. Secure mirrors on Orlan left and right arms
   Secure watch on Orlan right arm
   Temporarily stow comm cap near Orlan

4. Remove cover from helmet and stow into personal gear bag
   Open and close light filter
   Remove rubber cap from Orlan pressure gauge and stow in ЗИП-1 kit
   Launch cap ↔ from Orlan fluid umbilical connector and stow in ЗИП-1 kit

5. Unstow towing tether from kit (length is 1.5 m)
   Engage small hook on Orlan 2 backpack strap
   Route tether under Orlan left arm
   Stow large hook in Orlan left pocket

2.7. ORLAN AND БСС LEAK CHECK AND ORLAN VALVES FUNCTIONAL CHECK

2.7.1. ORLAN LEAK CHECK WITH ORLAN PRESSURE = 0.12

(00:30:00)

1. Prepare ЗИП-1 kit and personal gear bag
   Remove rubber rings from Orlan arm connectors and stow into personal gear bag
   Gloves →|← Orlan arms
   √ ~ 1 mm clearance near each of four yellow marks
   √ Lock restraints — closed
   √ Orlan pressure gauge, moisture collector, LiOH canister and feedwater line filter are installed on Orlan
   √ Moisture collector →|←backpack tube
   Remove cap from Orlan pressure gauge and stow in ЗИП-1 kit

ПГПУ 2. O_2 flow selector → ОТКЛ
БАЛЛОН → ОСН
√ ТО — ОТКЛ
Red cap ←|→ Orlan fluid connector
Fluid umbilical →|← Orlan
√ Fluid umbilical ←|→ other Orlan
Stow cap with Х6К electrical connector in ЗИП-1 kit
Electrical umbilical →|← Orlan
Close backpack internal cover
Backpack tension line ring → on hook
Seal Orlan with locking **handle**

БСС 3. O_2 OPEN-EVA
ПОВ ↓ PANEL ON (□ LED)
↓ SUIT 1 (2) ON (□ LED)
ПО-4 ПИТАНИЕ → БОРТ — ■ УТЕЧ, ВЕНТ МАЛ, **ЗВУК**
БСС — ⊕ НАДДУВ ПРОДУВКА ОРЛАН I, II
⊕ O_2 OPEN

4. If rubber cap →|← БСС O_2 tube
   | Rubber cap ←|→ БСС O_2 tube
   | Metal cap →|← free end of БСС O_2 tube
   Open an onboard БК-3 valve (number **per MCC-M instruction**)

БСС 5. — ○ O_2 OPEN
ПО-4 — ■ УТЕЧ
БСС PRESS until Orlan pressure = 0.12 — ○ НАДДУВ ПРОДУВКА ОРЛАН I, II
00:00:00 LEAK CHECK — ⊕ НАДДУВ ПРОДУВКА ОРЛАН I, II
■ УТЕЧ, **ЗВУК**
00:01:00 — ⊕ O_2 OPEN

√ Orlan pressure ≥ 0.08
◄ Orlan ΔP (00:00:30) < 1.5 increments
Record results in Table of 2.7.4

2.7.2. DUMP VALVE FUNCTIONAL CHECK

C A U T I O N

Do not allow Orlan pressure > 0.5

БСС	PRESS until Orlan pressure = 0.3---0.36	НАДДУВ ПРОДУВКА ОРЛАН I, II
	O_2 OPEN-EVA	НАДДУВ ПРОДУВКА ОРЛАН I, II
ПО-4		ВЕНТ МАЛ
ПГПУ	O_2 flow selector→ ИНЖ	
ПО-4		ИНЖ, ВЕНТ МАЛ
УДСК	Dump valve activation pressure = 0.38---0.45	
	Orlan pressure after dump valve activation = 0.38---0.41	
	Record results in Table of 2.7.4	
ПГПУ	O_2 flow selector → ОТКЛ	
ПО-4		ИНЖ, ВЕНТ МАЛ

2.7.3. SAFETY VALVE ПК-0.45 FUNCTIONAL CHECK

C A U T I O N

Do not allow Orlan pressure > 0.55

БСС	PRESS	НАДДУВ ПРОДУВКА ОРЛАН I, II
ПО-4		ВЕНТ МАЛ
УДСК	ПК-0.45 valve opening pressure = 0.42---0.50	
	Orlan pressure after ПК-0.45 valve activation = 0.42---0.45	
	Record results in Table of 2.7.4	
БСС	O_2 OPEN-EVA	НАДДУВ ПРОДУВКА ОРЛАН I, II
ПО-4		ВЕНТ МАЛ
УДСК	ПК-0.45 valve closing pressure ≥ 0.42	
	Record results in Table of 2.7.4	

2.7.4. ORLAN LEAK CHECK WITH ORLAN PRESSURE ≥ 0.4 AND ORLAN OXYGEN HOSES LEAK CHECK

1. If Orlan pressure < 0.42

БСС PRESS until Orlan pressure = 0.42 ○ НАДДУВ ПРОДУВКА ОРЛАН I, II
ПО-4 ◪ ВЕНТ МАЛ
00:00:00 LEAK CHECK ⊕ НАДДУВ ПРОДУВКА ОРЛАН I, II
00:01:00 ⊕ O_2 OPEN

◅ Δ Orlan pressure (over 00:01:00) < 2 increments
Fluid umbilical ↔ Orlan
◅ Δ Orlan pressure (over 00:01:00) < 2.5 increments
Record results in Valve Functional Check Table
Fluid umbilical →|← Orlan

БСС SUIT DEPRESS ○ O_2 OPEN

2. When Orlan pressure < 0.04

00:00:00 Fluid umbilical ↔ Orlan
Perform Orlan oxygen hoses leak check:
ПО-4 ◅ T (until □ УТЕЧ) > 00:03:00

Valve Functional Check Table

Check name		Orlan 1	Orlan 2
Leak check when Orlan pressure = 0.12 (2.7.1)			
Dump valve check (2.7.2)	Opening pressure		
	Pressure after valve activation		
Safety valve check (2.7.3)	Opening pressure		
	Pressure after valve activation		
	Closing pressure		
Leak check when Orlan pressure = 0.4 (2.7.4)	Δ Orlan pressure (with БСС)		
	Δ Orlan pressure (without БСС)		
Oxygen hoses leak check T (until □ УТЕЧ)			

2.7.5. ORLAN CHECK FINAL OPERATIONS

Close onboard БК-3 valve
Fluid umbilical →|← Orlan
БСС PURGE ⊕ all annunciators
O_2 CLOSED
Fluid umbilical ↔ Orlan
Fluid umbilical →|← onboard cap
Red cap (from ЗИП-1 kit) →|← Orlan fluid connector
ПГПУ O_2 flow selector → ИНЖ
ПО-4 ◪ ИНЖ, УТЕЧ, ВЕНТ МАЛ
ПГПУ БАЛЛОН → РЕЗ
ПОВ ↓ SUIT 1(2) OFF (■LED) ■ ИНЖ, УТЕЧ, ВЕНТ МАЛ
↓ PANEL OFF (■LED)
Install Orlan helmet visor cover
Install rubber cap on БСС O_2 tube in place of metal cap
Open Orlan sealing handle

3. ORLAN AND БСС STORAGE MODE

3.1. ORLAN PREPARATION FOR DRYING

Prepare ЗИП-1 and ЗИП-6 kits
Perform LiOH Canister, Moisture Collector And Feedwater LIne Filter Removal From ORLAN per 2.4.11
Measurement unit tubes → ХРАНЕНИЕ (stowage)
Feedwater bladder connector ↔ backpack water connector and stow into pocket on feedwater bladder restraint strap (water might leak from tube)
Open liner flap (right side)
Suit drying handle → perpendicular to cuirass (drying)

3.2. DRYING OF SUBLIMATOR WATER SUPPLY LINE

(01:00:00)

1. Configure drying circuit (Fig. 3.2-1):
   ПРБ-31 accessory →|← valve cover
   ПРБ-33 accessory →|← water bladder connector
   ПРБ-33 accessory →|← ПРБ-31 accessory

ЗИП-1 kit — Unstow dry wipes

ПГПУ

2. O_2 flow selector → ОТКЛ
   БАЛЛОН → ОСН
   Open primary БК-3 valve
   Sublimator → On
   (◁ ТО — ОТКЛ tab is hidden)
   √ Electrical umbilical →|← Orlan

ПОВ

3. ↓ PANEL ON (□ LED)
   ↓ SUIT 1, 2 ON (□ LED)

ПО-4
00:00:00

√ ⏻ ПИТАНИЕ — БОРТ
⏻ О.ВЕНТ
Blot water from feedwater line filter socket using wipe

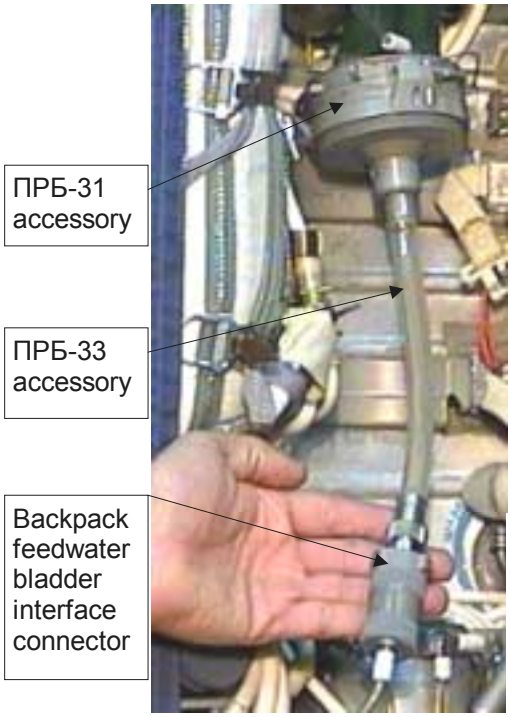


Fig. 3.2-1

C A U T I O N

Do not operate O.ВЕНТ and P.ВЕНТ simultaneously.

00:15:00 4. O.ВЕНТ

5. Reconfigure drying circuit:
ПРБ-33 accessory ↔ ПРБ-31 accessory and water bladder interface connector
Stow ПРБ-33 in ЗИП-6 kit
Do not remove ПРБ-31 (for subsequent Orlan drying)
ПРБ-40 →|← water bladder interface connector and secure connector using lirka clip
Additionally install (Fig. 3.2-2):
ПРБ-36 →|← ПРБ-35
Install ПРБ-35 on backpack collector (with mesh screen)
ПРБ-36 →|← moisture collector socket
ПРБ-43 ↔ feedwater line filter socket

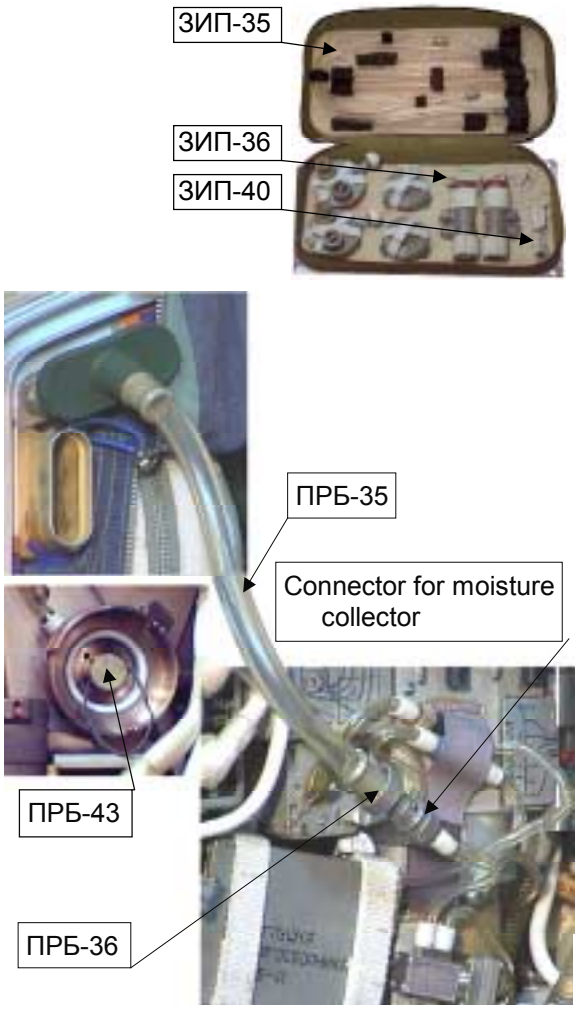


Fig. 3.2-2

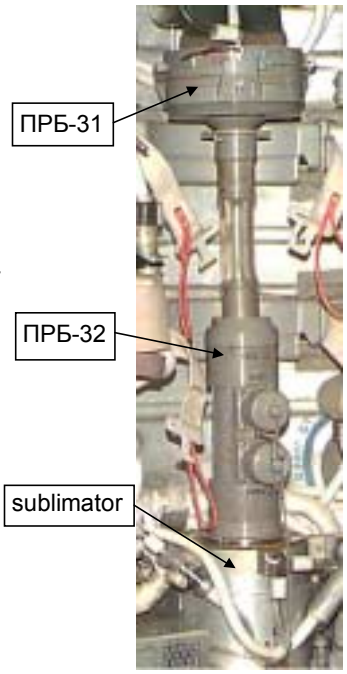
00:00:00
ПО-4 6. O.ВЕНТ
Perform drying
00:15:00 ПРБ-43 →|← feedwater line filter socket
Continue drying

00:30:00 7. O.ВЕНТ
ПОВ ↓ SUIT1(2) OFF (■ LED)
↓ PANEL OFF (■ LED)
Close primary БК-3 valve
ПГПУ O_2 flow selector → ИНЖ (to bleed excess of oxygen from Orlan tubes)
Sublimator → Off
Disassemble drying circuit (**Do not remove** ПРБ-43 and ПРБ-31 accessories)
Stow removed ПРБ accessories in ЗИП-6 kit

3.3. ORLAN DRYING

(00:20:00)

1. √ Gloves →|← Orlan
   √ ПРБ-31 →|← valve cover
   √ ПРБ-41 →|← moisture collector socket
   √ Suit drying handle → perpendicular to cuirass (drying)
2. Configure drying circuit:
   ПРБ-32 →|← ПРБ-31 accessory
   ПРБ-32 →|← Orlan sublimator ventilation manifold
   Remove red cap from ПРБ-30 accessory
   √ Red combined connector plug ←|→ Orlan fluid connector
   ПРБ-30 →|← Orlan fluid connector
3. Remove ПРБ-11 accessory (backpack restraint) and stow it in ЗИП-1 kit
   Close backpack internal cover
   Backpack tension line ring → on hook
   Seal Orlan by locking **handle**



ПОВ 4. ↓ PANEL ON (□ LED)
↓ SUIT 1, 2 ON (□ LED)
ПО-4 ⇳ ПИТАНИЕ → БОРТ
00:00:00 ⇳ О.ВЕНТ
02:00:00 ⇳ О.ВЕНТ, ⇳ Р.ВЕНТ

04:00:00 5. ⇳ Р.ВЕНТ
Open Orlan backpack and backpack internal cover
Remove ПРБ-32 accessory and stow it in ЗИП-6 kit
◅ Orlan is completely dry

6. If **additional drying** is required:
   ПРБ-37 →|← ПРБ-31
   ПРБ-33 →|← ПРБ37
ПО-4 ⇳ О.ВЕНТ
   Blow air on damp areas
   ⇳ О.ВЕНТ
7. Gloves ←|→ Orlan
   Unstow protective caps from personal gear bag and install them on arm connectors
   ◅ Gloves are completely dry
   If **additional drying** is required
   ПРБ-37 →|← ПРБ-31
   ПРБ-33 →|← ПРБ37
   ПРБ accessory (from СОКОЛ КВ-2 kit) →|← ПРБ-33
ПО-4 ⇳ О.ВЕНТ
   Perform final drying of gloves
   ⇳ О.ВЕНТ

ПОВ 8. ↓ SUIT 1, 2 OFF (■ LED)
↓ PANEL OFF (■ LED)
Remove all accessories (except ПРБ-41 and ПРБ-43) and stow in ЗИП-6 kit
Suit drying handle → parallel to cuirass (operation)
Close backpack internal cover
Backpack tension line ring → on hook

3.4. ORLAN AND БСС STORAGE MODE

(00:30:00)

1. Electrical umbilical ←|→ Orlan
   Electrical connector caps (from ЗИП-1 kit) (two) →|← X6K electrical connectors of Orlan and electrical umbilical
   Cover electrical umbilical connector with multilayer insulation shroud
2. Install Orlan pressure gauge rubber cap (from ЗИП-1 kit pocket) on Orlan pressure gauge
   Red cap (from ЗИП-1 kit) →|← Orlan fluid connector
   Perform БК-3 And Battery Removal From БРТА per 2.4.9
3. Unstow helmet and boots cloth covers, stowage cover from personal gear bag
   Lower sun filter
   Install helmet and boot covers
4. Don liquid cooling garment (after complete drying) onto foam-rubber mannequin
   Place liquid cooling garment cap on mannequin's chest
   Roll up liquid cooling garment (starting from legs)
   Wrap liquid cooling garment arms around rolled-up liquid cooling garment
   Ensure liquid cooling garment tubes are not twisted or kinked
   Stow liquid cooling garment in personal gear bag, let the water connectors hang from the bag side opposite to pocket
5. Stow hygienic trunks, cotton suit, socks in personal gear bag
   Zip personal gear bag so that liquid cooling garment connectors remain outside
   Stow in personal gear bag pocket:
   gloves,
   comm cap (putting earphone pads together),
   mirrors
   Liquid cooling garment water connectors →|← Orlan water connectors
   ◅ water hoses are not twisted and kinked
   Stow personal gear bag inside Orlan (ensure pocket is facing upwards)
6. √ Protective caps (two for each Orlan) are installed on arm connectors
   √ X3, X9 electrical connectors (two) are stowed in Orlan chest pocket
   Open backpack internal cover
   √ Measurement unit filter tubes — ХРАНЕНИЕ
   √ ПРБ-43 accessory is installed in feedwater line filter socket
   √ Feedwater bladder connector — in pocket on bladder restraint lower strap
   √ LiOH canister is removed from backpack
   √ ПРБ-41 cap is installed into moisture collector socket
   √ Suit drying handle is parallel to cuirass
   √ Protective cap →|← Orlan fluid connector
   √ Reserve БК-3 valve – **closed**

ПГПУ
   √ O_2 flow selector — ИНЖ
   √ БАЛЛОН — РЕЗ
   √ РЕГУЛЯТОР — ОСН
   √ ТО — ОТКЛ

ПО-4
   √ О.НАС, О.ВЕНТ, Р.НАС, Р.ВЕНТ, ПИТАНИЕ — БОРТ
   Close backpack internal cover
   √ Sealing interfaces are free of any foreign objects and backpack internal cover
   √ ПРБ-11 ←|→ Orlan
   Backpack tension line ring → on hook (**do not close** locking handle)
   Stow Orlan electrical connector and safety tether hooks in pockets of Orlan legs

7. Cover Orlan helmet and backpack with Orlan stowage cover
   Rotate Orlan arms up to stop and insert into stowage cover pockets
   Cover both ПО-4 and ПГПУ panels with stowage cover side flap (see Fig. 3.4-1)
   Fasten side flap of stowage cover
   Fold leg shells in half, placing boots on БРТА next to backpack bottom (with toes facing outside)
   Route 0.7 m long strap (from ЗИП-1 kit) through loops on longitudinal and transverse straps of Orlan stowage cover and tighten leg shells
   Return Orlan attachment node to its storage position

БСС 8. √ O_2 CLOSED
   √ Rubber cap →|← connector of БСС oxygen tube
   √ Fluid umbilicals →|← caps
   Attach БСС fluid umbilicals to ПхО handrails

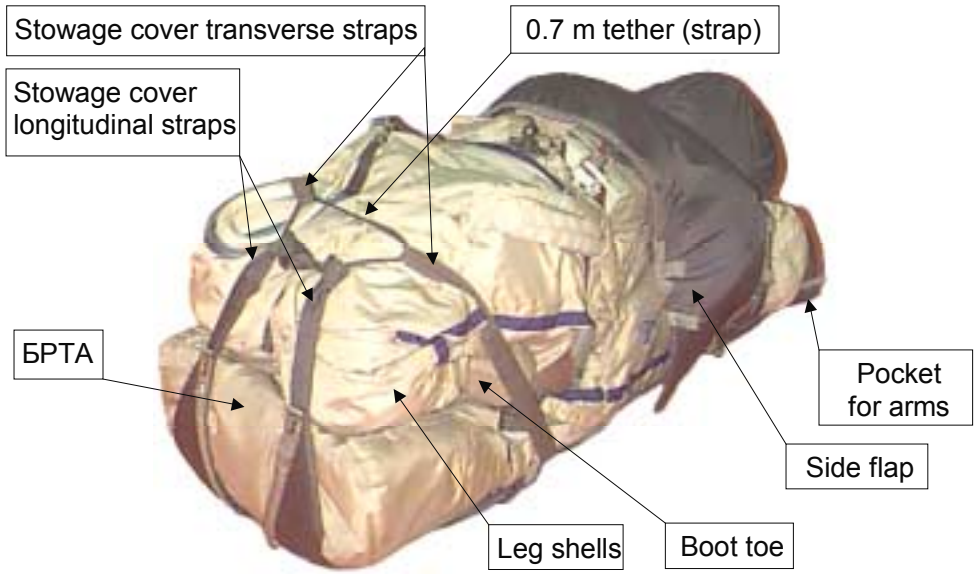


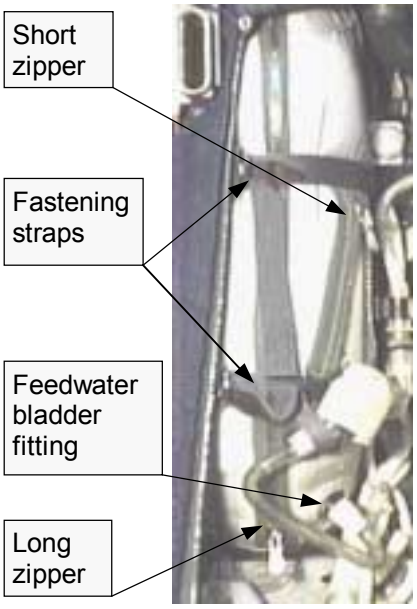
Fig. 3.4-1. Orlan stowage configuration

4. ORLAN MAINTENANCE AND REPAIR

4.1. ORLAN FEEDWATER BLADDER REPLACEMENT

(00:30:00)

1. ORLAN WATER BLADDER REMOVAL
   √ Feedwater bladder ←|→ backpack connector
   Loosen fastening straps of feedwater bladder restraint
   Unzip long zipper of feedwater bladder restraint
   Grasp top end of feedwater bladder and remove from feedwater bladder restraint
2. NEW FEEDWATER BLADDER INSTALLATION
   Route feedwater bladder connector through opening in feedwater bladder restraint to face outside
   Insert bladder into feedwater bladder restraint
   Align feedwater bladder fitting with opening in feedwater bladder restraint
   Place visible glued seam of feedwater bladder under left half of feedwater bladder restraint
   √ Feedwater bladder is not twisted or kinked
   Zip long zipper of feedwater bladder restraint
   √ Short zipper on feedwater bladder restraint is completely unzipped
3. Refill feedwater bladder per 2.4.14
   Feedwater bladder connector → pocket on lower fastening strap of feedwater bladder restraint



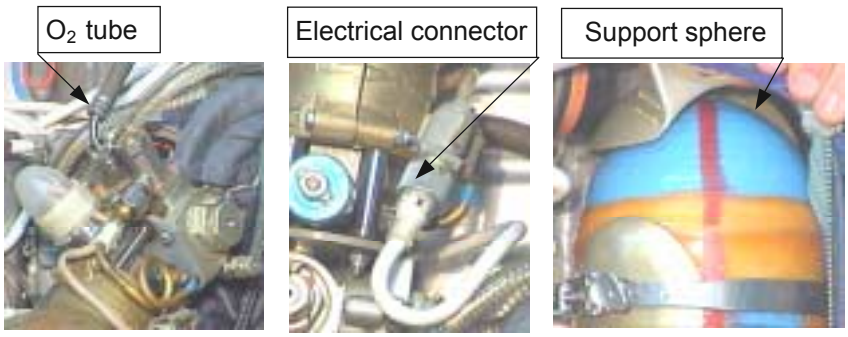
4.2. RESERVE БК-3 REPLACEMENT

(00:30:00)

NOTE
Reserve БК-3 may be replaced **on MCC-M GO**, if БК-3 pressure < 360

1. RESERVE БК-3 REMOVAL
   Remove LiOH canister (see 2.4.11)
   Close reserve БК-3 valve (using special wrench from ЗИП-1 kit)

ПГПУ
   БАЛЛОН → РЕЗ
   O_2 flow selector → ИНЖ (to bleed excess of oxygen from Orlan)
   O_2 flow selector → ОТКЛ
   Disconnect rubber straps and clamps securing БК-3 (if any)
   Rotate БК-3 a quarter of a turn in direction of blue arrow on БК-3, remove БК-3 from cradles
   O_2 tube ←|→ БК-3
   Remove electrical connector from lirka clip
   Electrical connector ←|→ БК-3



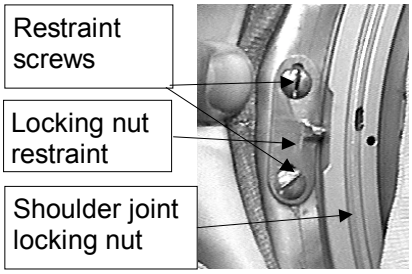
   During the first replacement of reserve БК-3, remove clamps:
   - Remove rubber stickers from inside of clamps next to winged screws
   - Straighten clamp straps and remove winged screws
   - Remove clamps from brackets
   - Discard clamps in trash

2. INSTALLATION OF RESERVE БК-3
   O_2 tube →|← new БК-3
   БК-3 electrical connector →|← backpack electrical connector, install mated connector in lirka clip
   Set БК-3 bottom against backpack support sphere so that red stripe on БК-3 is rotated a quarter of a turn relative to stripe on backpack
   ↷ БК-3 a quarter of a turn in the opposite direction of blue arrow and install БК-3 onto backpack cradles so that both red stripes are aligned
   Secure БК-3 with clamps
   √ БК-3 valve does not press against Orlan housing during backpack closure

4.3. ORLAN ARMS REPLACEMENT

(02:00:00 for two arms)

1. ARM REMOVAL



Remove Orlan stowage cover from Orlan
Secure Orlan using Orlan restraint probe
(if necessary, use extension)
Prepare ЗИП-3 kit and screwdriver
Open backpack
Liquid cooling garment ←┼→ Orlan
Unstow personal gear bag from Orlan
Arm vent tubes ←┼→ Orlan vent tubes
Remove two restraint screws and remove shoulder joint locking nut restraint from Orlan housing
Loosen screw (2 ---2.5 turns) on shoulder joint locking nut

NOTE

If it is difficult to start nuts, pressurize Orlan with БСС until Orlan pressure =0.4 and start nuts (1.5---2 turns). Then depress Orlan and continue

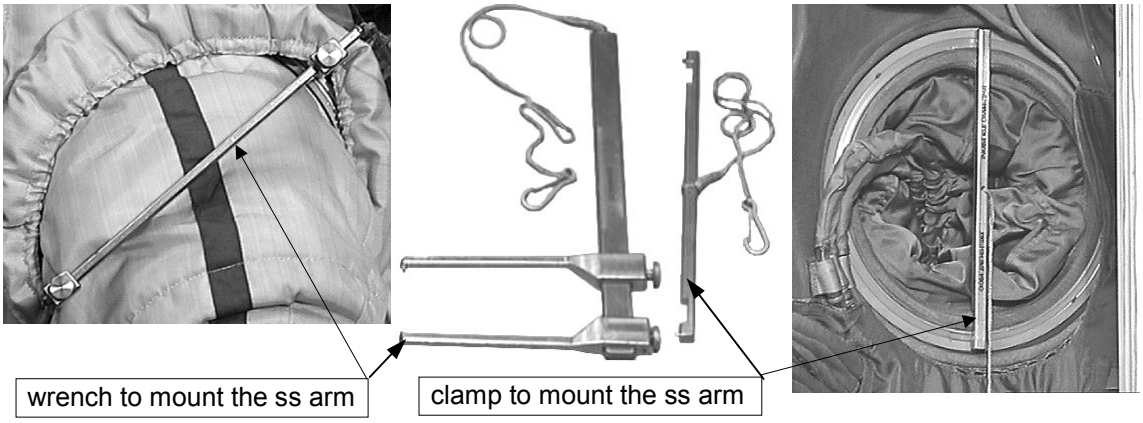
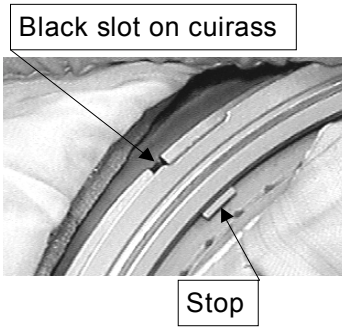


Fig. 4.3-1

Insert the ss arm mounting wrench (from ЗИП-3 kit) into opposite slots on shoulder joint locking nut and loosen it, while restraining exterior part of shoulder joint from inside of cuirass using the ss arm mounting clamp
Remove arm inside by gently tapping with hand on shoulder joint perimeter from outside of cuirass

2. NEW ARM INSTALLATION



Unstow new arm from stowage cover
Insert arm from inside of cuirass:
One operator (inside Orlan) inserts shoulder joint into front part of socket, then, by gently tapping on shoulder joint perimeter, fully inserts it into socket;
Other operator (outside Orlan) monitors, so the stop on shoulder joint aligns with black slot on cuirass ring and ensures shoulder joint is properly aligned

Lubricate shoulder joint thread using lubricant for sealing rings from ЗИП-1 kit
Fully tighten locking nut screw, then slightly loosen it (half of a turn)

C A U T I O N
When screwing locking nut in shoulder joint, make sure both threads are aligned, do not cross-thread.

Engage locking nut on shoulder joint with nut number outwards
(seams on Orlan multilayer insulation may be unlaced for better access to locking nut)
Insert ss arm mounting clamp into opposite slots on interior shoulder joint locking nut
Fully tighten locking nut using ss arm mounting wrench; simultaneously prevent shoulder joint rotation using ss arm mounting clamp
◅ Stop aligned relative to black slot on cuirass ring
Expand vent tubes on Orlan arms using expander
Arm vent tubes →|← Orlan vent tubes, do not cross

3. FINAL OPERATIONS
Perform Orlan pressurization check per 4.7
After pressurizing, tighten locking nut and screw to the hard stop
If nut restraint holes did not align with previously used mounting holes on locking nut, use other two holes to install nut restraint and secure with two screws
Using cord needle (from ЗИП-3 kit), lace up seams on Orlan multilayer insulation (if previously undone) and on Orlan internal liner where arm and Orlan vent tubes are connected
Perform Orlan Leak Check with Orlan Pressure = 0.4 and Orlan Oxygen Hoses Leak Check per 2.7.4 step 1 and Orlan Valve Check Final Operations 2.7.5

Open backpack
Liquid cooling garment →|← Orlan
Stow personal gear bag in Orlan
Backpack tension line ring → on hook
Install Orlan stowage cover on Orlan

4.4. ORLAN LEG BLADDER REPLACEMENT

(02:00:00)

1. LEG BLADDER REMOVAL
   Remove stowage cover from Orlan
   Secure Orlan using Orlan restraint probe
   Prepare ЗИП-3 kit
   Open Orlan backpack
   Liquid cooling garment ←|→ Orlan
   Unstow personal gear bag from Orlan
   Unlace liner inside Orlan along leg bladder perimeter
   Leg bladder vent tubes ←|→ Orlan vent tubes
   Unlace Orlan multilayer insulation along legs and crotch internal seam
   Unlace Orlan multilayer insulation from boots, leg bladder (along belt, leg multilayer insulation should remain connected to cuirass multilayer insulation)
   Roll up leg multilayer insulation to provide access to bolts fastening legs flange to cuirass flange
   Using leg bladder mounting wrench (from ЗИП-3 kit), loosen twenty captive bolts (ascending order of bolt numbers)
   Remove leg bladder

2. NEW LEG BLADDER INSTALLATION
   Unzip new Orlan legs stowage cover
   Using leg bladder mounting wrench, loosen twenty captive bolts
   Unstow new legs bladder from stowage cover
   New legs bladder flange →|← cuirass flange
   √ Both cuirass and legs bladder flanges are clear of foreign objects and of multilayer insulation
   Tighten bolts in a cross fashion to remove the slack between flanges
   Perform final tightening (ascending order of bolt numbers) using **only** the leg bladder mounting wrench
   Lace up leg shell multilayer insulation from inner thigh and crotch area; tie to boots
   Leg bladder vent tubes →|← Orlan vent tubes
   Fasten cuirass liner to legs bladder using Velcro

3. FINAL OPERATIONS
   Perform Orlan Pressurization per 4.7
   Perform Orlan Leak Check per 2.7.4 step 1 and Orlan Check Final Operations per 2.7.5
   Perform Orlan Size Adjustment per 2.5
   Open backpack
   Liquid cooling garment →|← Orlan
   Stow personal gear bag into Orlan
   Close backpack
   Install Orlan stowage cover onto Orlan

4.5. VISOR PROTECTIVE SHIELD REPLACEMENT

Unstow:
new visor protective shield;
40---50 cm kapron gray cord from ЗИП-3 kit, or any available analog
Fold kapron cord in two, forming a loop. Route folded cord underneath spring-loaded hook attached to screw on either side of protective shield
Use cord to assist in removing hooks from screws (first one side, then the other)
Detach Orlan multilayer insulation from Velcro under lower edge of visor protective shield
Unsecure central clip of visor protective shield (attached with Velcro)
Remove visor protective shield
Install new visor protective shield and secure central clip on Velcro
√ LEDs plates on helmet's lower edge should be aligned with slots in visor protective shield
Use kapron cord to assist in securing spring-loaded hooks to shield screws
Attach multilayer insulation to Velcro under lower edge of helmet visor

4.6. ORLAN SUN VISOR REPLACEMENT

Unstow:
new sun visor from ЗИП-3 kit
standard screwdriver
Remove old sun visor by removing four screws
Install new sun visor by tightening four screws

4.7. ORLAN PRESSURIZATION CHECK

(00:15:00)

1. Prepare ЗИП-3 kit
   √ Gloves →|← Orlan arms
   √ Feedwater line filter and moisture collector are installed in backpack
   √ Sublimator tube connector →|← moisture collector
   Rubber cap (from ЗИП-3 kit) →|← ПК-0.45 safety valve (under cuirass liner behind right shoulder joint)
   Fluid umbilical →|← Orlan fluid connector
   Backpack tension line ring → onto hook
   Seal Orlan by locking **handle**
   √ All БСС oxygen tube connectors →|← onboard БК-3 or metal caps

Cap

CAUTION

Do not allow Orlan pressure > 0.6

2. Open onboard БК-3 valve (√ **MCC-M** for serial number)

БСС PRESS until Orlan pressure = 0.55 **********

****

Close onboard БК-3 valve

SUIT DEPRESS

When Orlan pressure < 0.05 open backpack

√ Cap →|← ПК-0.45 safety valve **hermetically**

Seal Orlan by locking **handle**

Repeat step 2

****

00:00:00 Fluid umbilical ←|→ Orlan

Close onboard БК-3 valve

SUIT DEPRESS

00:05:00 3. Fluid umbilical →|← Orlan

When Orlan pressure = 0.02---0.04, open backpack

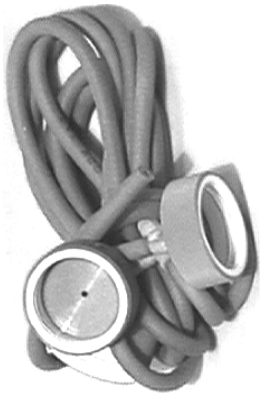
Rubber cap ←|→ ПК-0.45 safety valve

Stow cap in ЗИП-3 kit

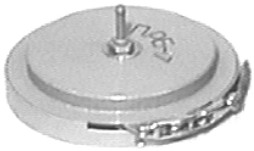
4.8. ORLAN RESERVE PRESSURE BLADDER LEAK CHECK

(00:10:00)

1. Prepare ЗИП-3 kit
Open Orlan
Liquid cooling garment ↔ Orlan
Unstow personal gear bag from Orlan
Remove protective caps from both arms and stow caps in personal gear bag
Glove →|← any arm
Install moisture collector and feedwater line filter in backpack (see 2.4.3, 2.4.4)



ПРК-3А



ПРБ-17

ЗИП-3 2. Unstow ПРК-3А and ПРБ-17 accessories
Lubricate O-rings of ПРК-3А with lubricant from ЗИП-1 kit
ПРК-3А caps →|← relief valves (three) of Orlan arms and legs
Route free tube of ПРК-3А through Orlan arm without glove
Free tube of ПРК-3А →|← inner fitting of ПРБ-17
ПРБ-17 →|← Orlan arm without glove
Fluid umbilical →|← Orlan
√ Other fluid umbilical →|← onboard cap
On MCC-M GO perform reserve bladder pressurization check

3. Backpack tension line ring → on hook
Seal Orlan by locking **handle**

БСС √ O2 CLOSED — O2 OPEN
Open onboard БК-3 valve (√ **MCC-M** for serial number)

00:00:00 PRESS until Orlan pressure = 0.42 — НАДДУВ ПРОДУВКА ОРЛАН I, II; O2 OPEN

Via ПРБ-17 fitting leak air

00:02:00 There is no more air leak ********** ********** ********** **********

Close onboard БК-3 valve
SUIT DEPRESS
When Orlan pressure < 0.05 open backpack
ПРК-3А ↔ and again →|← relief valves
Repeat step 3

LEAK CHECK — НАДДУВ ПРОДУВКА ОРЛАН I, II; O2 OPEN

УДСК 4. ◁ Δ Orlan pressure (00:01:00) < 2 increments ********** **√MCC-M**
SUIT DEPRESS — O2 OPEN
When Orlan pressure < 0.04, open backpack
Remove ПРК-3А caps and ПРК-17 fitting from Orlan and stow in ЗИП-3 kit
Close onboard БК-3 valve

БСС PURGE — O2 OPEN
O2 CLOSED
Fluid umbilical ↔ Orlan
Fluid umbilical →|← onboard cap
Glove ↔ Orlan arm
Protective caps →|← both Orlan arms
Liquid cooling garment →|← Orlan
Stow personal gear bag in Orlan
Backpack tension line ring → on hook

4.9. ORLAN INTERBLADDER VOLUME LEAK CHECK

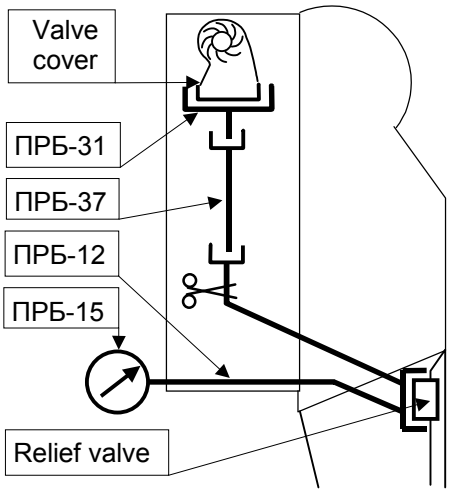
(00:40:00)

1. Open backpack and secure using ПРБ-11 accessory
   Liquid cooling garment ↔ Orlan
   Unstow personal gear bag from Orlan
   Open backpack internal cover
   If LiOH is installed in Orlan, remove it (see 2.4.11 step 1)

ЗИП-1 Unstow ПРБ-11, ПРБ-12, ПРБ-15 accessories, tongs

ЗИП-6 Unstow ПРБ-31, ПРБ-37 accessories

2. Assemble leak check circuit:
   ПРБ-31 →|← ПРБ-37
   ПРБ-31 →|← valve cover
   Tube of ПРБ-12 →|← ПРБ-37
   Cap of ПРБ-12 →|← any of three relief valves of arms and legs
   ПРБ-15 →|← ПРБ-12
   Electrical umbilical →|← Orlan



ПОВ 3. ↓ PANEL ON (□ LED)
↓ SUIT 1 (2) ON (□ LED)

ПО-4 √ ПИТАНИЕ → БОРТ ■ УТЕЧ, ВЕНТ МАЛ
Take tongs
O.ВЕНТ

ПРБ-15 When pressure = 14---16 increments pinch tube ПРБ-12 with tongs

C A U T I O N

During leak check, avoid contact of pressure bladders with any sharp objects.

ПО-4 O.ВЕНТ
Straighten folds of innerbladders (by patting them gently)

ПРБ-15 If pressure drop < 10 increments:
- Remove fongs from tube

ПО-4
- O.ВЕНТ
- When pressure = 10---13 increments, pinch tube again
- O.ВЕНТ
- Straighten folds of innerbladder (by patting them gently)

ПРБ-15 4. When pressure = 10---13 increments
◅ Δ pressure (00:05:00) < 0.5 inc for Orlan arms ********** Report to **MCC-M**
(◅ Δ pressure (00:10:00) < 0.5 inc for Orlan legs)
Repeat leak check for two remaining relief valves of Orlan

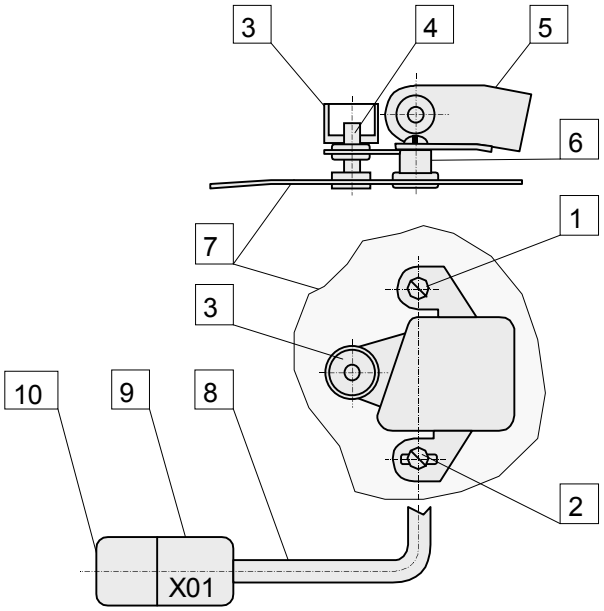
5. Disassemble leak check circuit

ПОВ ↓ SUIT 1 (2) OFF (■ LED)
↓ PANEL OFF (■ LED)
ПРБ-11 ↔ Orlan
Stow tongs, ПРБ-11, ПРБ-12, ПРБ-15 in ЗИП-1 kit
Stow ПРБ-31, ПРБ-37 in ЗИП-6 kit
Stow personal gear bag into Orlan
Liquid cooling garment →|← Orlan
Close Orlan

4.10. ORLAN LIGHT MAINTENANCE

1. ORLAN LIGHT REMOVAL (00:10:00)

Cover Orlan visor with helmet cloth cover (to avoid scatches while working with screwdriver)
Prepare small-tip screwdriver for M3 screws
ПО-4 ⏚ ПИТАНИЕ → БОРТ
ПОВ ↓ SUIT 1 (2) OFF
Demate light X01 (X02) electrical connector in back part of helmet housing (hidden behind multilayer insulation)
Remove adjustment nut (3) from threaded pin (4) (see Fig. 4.10-1)
Remove captive screws (1), (2) from sockets (6)
Remove light and discard



1, 2 – captive screws
3 – adjustment nut
4 – threaded pin
5 – light housing
6 – socket
7 – helmet housing
8 – electrical cable
9 – electrical connector
10 – transport cap

Fig. 4.10-1 Helmet Right Light СМ-2П
(Helmet Left Light СМ-2Л is a mirror image of СМ-2П)

2. LIGHT СМ-2П (СМ-2Л) INSTALLATION

Unstow new light from kit (√ **MCC-M** for kit number)
Unpack light
Transport cap ←|→ electrical connector
Light X01 (X02) electrical connector →|← X01 (X02) connector of Orlan cable on right (left) side of helmet back part
Engage adjusment nut (3) on threaded pin (4) so that pin's end is flush with nut
Tighten screws (1), (2) (two) in sockets 6 (3---4 turns)
Rotate light around screw (1) so that screw (2) aligned with the middle of the light lug slot
Tighten screws (1), (2) (two) to the hard stop
Cover adjustment nut (3) with flap of multilayer insulation

3. LIGHT FUNCTIONAL CHECK (00:10:00)

Electrical umbilical →|← Orlan

ПОВ ↓ SUIT 1 (2) ON

ПО-4 ПИТАНИЕ → БОРТ, СВЕТ

Both bulbs in each light come on

Illumination is sufficient (extinguish all other light sources):
switches, symbols and labels on ПО-4 are clearly visible;
small objects (tools, etc.) in working zone are clearly seen

Working zone is a 1 m circle with its center located in front of Orlan at a distance of 25 cm from ПО-4 lower edge

If necessary, adjust light beam direction:
- Loosen two screws (1), (2) (2---3 turns)
- Adjust vertically by rotating around screw (1) axis
- Adjust horizontally by rotating nut (3)
- Retighten two screws (1), (2) to the hard stop

ПО-4 СВЕТ

ПОВ ↓ SUIT 1 (2) OFF

Electrical umbilical ←|→ Orlan (**on МСС-М GO**)

4.11. ORLAN AND БСС CHECK USING ORLAN TESTING UNIT (ПКО-М)

4.11.1. ORLAN INITIAL STATUS CHECK

√ LiOH canister, moisture collector, primary and reserve БК-3 are installed in Orlan

ПО-4 БК-3 pressure ≥ 150

√ БК-3 valves — **closed**

√ X107, X109 connectors (two) ←|→ БРТА

Orlan X107 connector →|← X107 cap from ПКО-М kit

√ Gloves ←|→ Orlan

ПО-4 √ О.НАС, О.ВЕНТ, Р.НАС, Р.ВЕНТ

√ ПИТАНИЕ — АВТ

√ ТАНГ, ОСН, РЕЗ

ПГПУ √ O_2 flow selector — ОТКЛ

√ БАЛЛОН — ОСН

√ Fluid umbilical ←|→ Orlan

4.11.2. ORLAN TESTING UNIT (ПКО-М) SETUP

Unstow ПКО-М from stowage bag

Remove cover from ПКО-М by releasing two locks

Remove X6К electrical connector from lirka clip

Cover → ПКО-М stowage bag

ПКО-М √ СЕТЬ

√ sw SA1 — ВЫКЛ

√ sw SA2 — Jдв ОРЛ

√ SA3 — ПИТАНИЕ

√ sw SA4 — 1

Unstow ground strap from foam cover

Caps (two) ←|→ XT-1 electrical connector and ground strap connector

Caps → foam cover

Foam cover → ПКО-М stowage bag

Assemble circuit:

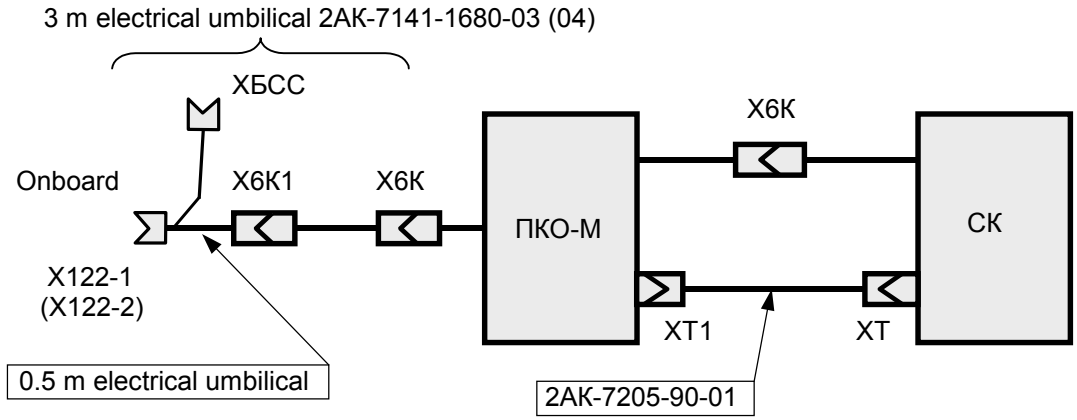


Fig. 4.11-1. Electrical connection diagram for Orlan check using ПКО-М.

Route ground strap through Orlan arm with XT1 connector remaning outside
Ground strap XT1 connector →|← XT1 electrical connector of ПКО-М
Cap ←|→ XT electrical connector (in backpack, to the right of feedwater bladder)
Stow cap in ПКО-М stowage bag
Ground strap XT connector →|← backpack XT electrical connector
ПКО-М Х6К male connector →|← electrical umbilical
ПКО-М Х6К female connector →|← Orlan Х6К electrical connector
√ Electrical umbilical →|← onboard Х122 electrical connector

Backpack tension line ring → on hook
Seal Orlan by locking **handle**

ПОВ ↓ PANEL ON (□ LED)
↓ SUIT 1(2) ON (□ LED)

4.11.3. FAN AND PUMP ELECTRIC MOTORS FUNCTIONAL CHECK. ELECTRIC MOTOR CIRCUIT BREAKER FUNCTIIONAL CHECK

C A U T I O N

If ammeter constantly goes off-scale:
Discontinue Orlan testing unit operation
СЕТЬ
Report to MCC-M

ПКО-М 1. sw SA1 → ОСН.ВЕНТ
СЕТЬ
ПО-4 ПИТАНИЕ → БОРТ
ПКО-М УТЕЧКА ГАЗА, ПИТАНИЕ
ПО-4 УТЕЧ, ВЕНТ МАЛ
ПКО-М reading < 23
ПО-4 presence of pressure reading
О.ВЕНТ ВЕНТ МАЛ
fan operation
ПКО-М reading stays within 26---31 range
SB1
fan switchover and operation
ПО-4 annunciation does not change
ПКО-М 2. sw SA1 → РЕЗ.ВЕНТ
SB1
fan stops
ПО-4 ВЕНТ МАЛ
ПКО-М reading < 23
ПО-4
00:00:00 3. О.ВЕНТ
00:10:00 Р.ВЕНТ ВЕНТ МАЛ
fan operation
ПКО-М reading stays within 26---30 range
ПО-4 Р.ВЕНТ ВЕНТ МАЛ
fan stops
ПКО-М reading < 23
ПО-4 О.НАС
pump operation
ПКО-М reading < 23
4. Open backpack
sw SA1 → ОСН. НАС
SB1
pump switchover and operation
reading < 25
sw SA1 → РЕЗ. НАС
SB1
pump stops
reading < 23

00:00:00
ПО-4 5. O.НАС
ПКО-М ◁ annunciation and readings do not change
00:10:00
ПО-4 Р.НАС
pump operation
ПКО-М ◁ reading < 25
ПО-4 Р.НАС
pump stops
ПКО-М ◁ reading < 23
sw SA1 → ВЫКЛ
◁ annunciation and readings do not change
Close Orlan backpack

4.11.4. LIGHT SYSTEM CIRCUIT CHECK

ПО-4 СВЕТ
◁ both bulbs in each Orlan light come on
ПКО-М ◁ reading < 26
ПО-4 СВЕТ
◁ both Orlan lights go off
ПКО-М ◁ reading < 23

4.11.5. MEASUREMENT UNIT FUNCTIONAL CHECK

ПКО-М 1. sw SA2 → Vик, БЕТА
◁ reading stays within 20---21 range
sw SA4 → 2
◁ reading stays within 23---28 range
sw SA4 → 3
◁ reading stays within 24---31 range
sw SA4 → 5
◁ reading < 22
sw SA4 → 6
◁ reading < 22
sw SA4 → 7
◁ reading < 22
ПО-4 2. О.ВЕНТ ■ ВЕНТ МАЛ
fan operation
ПКО-М ◁ reading stays within 27---34 increments
ПО-4 О.ВЕНТ ◪ ВЕНТ МАЛ
fan stops
ПКО-М ◁ reading stays within < 22 range
sw SA4 → 8
◁ reading stays within 20---25 range (needle fluctuates in this range)
sw SA4 → 9
◁ reading stays within 24---27 range
sw SA4 → 10
◁ reading 20

4.11.6. RADIO COMM CHECK

Open backpack
Retrieve X3 cap from ПКО-М cover pocket
X3 cap →|← Orlan X3 connector
ПКО-М sw SA2 → ЦЕПИ СВЯЗИ
sw SA4 → 9
◅ reading stays within 30---32 range

4.11.7. ПГПУ (PNEUMOHYDRAULIC CONTROL PANEL) CIRCUIT CHECK

Panel	Operation	ИП ПКО-М reading	ПО-4 alarm
backpack	Open reserve БК-3 valve		◘ ИНЖ, ВЕНТ МАЛ, УТЕЧ
ПКО-М	sw SA2 → ПГПУ sw SA4 → 7	30---32	
ПГПУ	O_2 flow selector → АВАР	20---21	■ ВЕНТ МАЛ
	O_2 flow selector → ИНЖ	30---32	◘ ИНЖ, ВЕНТ МАЛ, УТЕЧ
ПКО-М	sw SA4 → 6	20---21	
ПГПУ	O_2 flow selector → ОТКЛ	30---32	■ ИНЖ
ПКО-М	sw SA4 → 5	30---32	
ПГПУ	БАЛЛОН → РЕЗ		
ПКО-М	■ УТЕЧ.ГАЗА	20---21	■ УТЕЧ
ПГПУ ПКО-М	БАЛЛОН → ОСН O_2 flow selector → ИНЖ □ УТЕЧКА ГАЗА	30---32	◘ ИНЖ, УТЕЧ
ПГПУ	O_2 flow selector → ОТКЛ		■ ИНЖ
ПКО-М	sw SA4 → 4	30---32	
	Fluid umbilical →|← Orlan	20---21	
	Fluid umbilical ←|→ Orlan	30---32	

4.11.8. O2 МАЛО (O2 LOW) ANNUNCIATION CIRCUIT CHECK

ПКО-М ⏻ СЕТЬ ■ all annunciators
ПО-4 ■ all annunciators
X3КР electrical connector of primary БК-3 ←|→ backpack electrical connector
Remove X3КР cap from ПКО-М cover pocket
Cap ←|→ backpack X3КР electrical connector
ПКО-М sw SA4 → 3
⏻ СЕТЬ □ УТЕЧ. ГАЗА, O_2 МАЛО, ПИТАНИЕ
ПО-4 ◘ УТЕЧ, ВЕНТ МАЛ, O_2 МАЛО

4.11.9. WIRING INSULATION RESISTANCE CHECK

Panel	Operation	ИП ПКО-М reading	ПО-4 alarm
ПКО-М	sw SA2, SA3 → R изоляции √ sw SA4 — 3 □ ПИТАНИЕ	< 25	■ all annunciators
ПО-4	⏻ О.ВЕНТ, Р.ВЕНТ, О.НАС, Р.НАС, СВЕТ	< 25	■ all annunciators
	⏻ О.ВЕНТ, Р.ВЕНТ, О.НАС, Р.НАС, СВЕТ	< 25	■ all annunciators
ПКО-М	sw SA4 → 2	< 25	■ all annunciators
	sw SA4 → 1	< 25	■ all annunciators
backpack ПГПУ ПО-4 ПОВ	⏻ СЕТЬ sw SA1 → ВЫКЛ sw SA2 → Jдв ОРЛ ⏻ SA3 → ПИТАНИЕ ■ ПИТАНИЕ Close reserve БК-3 valve O_2 flow selector → ИНЖ БАЛЛОН → РЕЗ ⏻ ПИТАНИЕ → АВТ ⭳ SUIT 1 (2) OFF (■ LED) ⭳ PANEL OFF (■ LED) X3, X3КР caps (two) ↔ Orlan electrical connector Stow X3, X3КР caps in ПКО-М cover pockets Disassemble check circuit		

4.11.10. ORLAN INTERFACE UNIT (БСС) CHECK

БСС

O₂ CLOSED

Configure circuit:

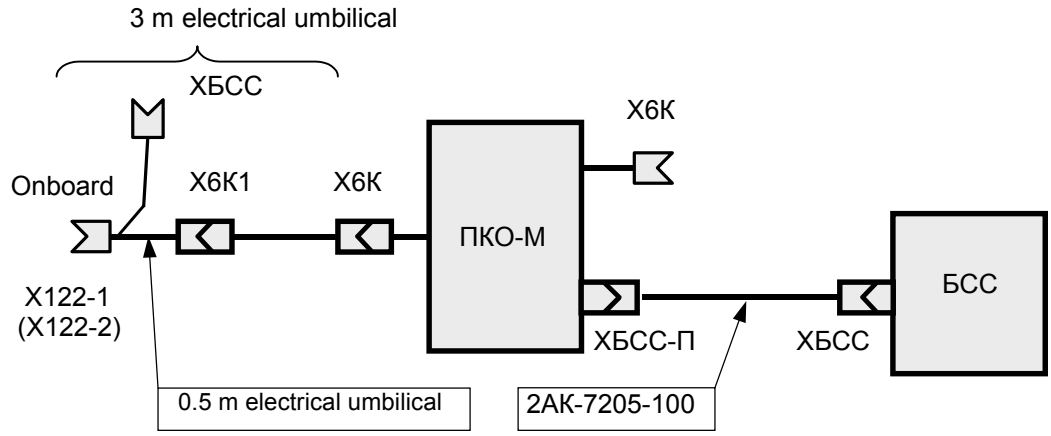


Fig. 4.11-2. Electrical connection diagram for БСС check using ПКО-М

Panel	Operation	ИП ПКО-М reading
ПКО-М	СЕТЬ sw SA2 → U ик, БЕТА sw SA4 → 4 □ ПИТАНИЕ	 22---24
БСС	PRESS LEAK CHECK Safety pin → UNLK SUIT DEPRESS PURGE PREBREATHE-A/L DEPRESS O₂ OPEN-EVA O₂ CLOSED	22---24 22---24 25---27 27---30 22---24 21---22 22---24
ПКО-М	СЕТЬ sw SA2 → Jдв ОРЛ sw SA4 → 1 ■ ПИТАНИЕ Disassemble check circuit	 20

4.12. KORONA VOLUME LEVEL CONTROL

(00:30:00)

1. ORLAN AND БРТА SETUP

Secure Orlan in ПхО
Install БРТА on Orlan (2.4.5)
Do not install БК-3 in БРТА, if installed – remove (2.4.9)
Install battery in БРТА (2.4.7)
Open cover that protects XWA3 and XWA4 connectors
Open rubber cap covering potentiometers
Comm cap →|← Orlan X3 connector

2. COMM SYSTEM ACTIVATION

EV1
ИнПУ SM: SM COMM CONTROL
□ SM COMM READY UNIT
EVA COMM **ON** □ EVA COMM
VHF2 duplex **ON** □ VHF2 duplex
Don low noise headset

EV2
ПА ПхО ↓ CHANNEL 3 (□ LED)
↓ XMIT □ XMIT3 LED
Don comm cap

БРТА ⏻ ОРЛАН
ПО-4 ⏻ ПИТАНИЕ → АВТ
↓ ОСНОВ, ТАНГ

3. VOLUME LEVEL CONTROL

NOTE

1. Right potentiometer screw is used to change volume of primary Korona set, left potentiometer screw is used to change volume of reserve Korona set
2. Rotate potentiometer screw ↶ to increase volume level, and ↷ to decrease volume level
3. Use jeweler's screwdriver from ISS tool kit for sound volume adjustment

C A U T I O N

When adjusting volume level, **do not change** position of dip switches that configure alarm signal generator and transmitter's frequency

While EV1 counts aloud in normal voice
БРТА EV2 adjusts right potentiometer screw to achieve best sound quality
ПО-4 ↓ РЕЗЕРВ
Adjust left potentiometer screw

4. FINAL OPERATIONS

ПО-4 √ РЕЗЕРВ, ТАНГ
ПИТАНИЕ → БОРТ
БРТА ОРЛАН
ПА ПхО √ XMIT, CHANNEL 3 (■ LED)
ИнПУ SM: SM COMM CONTROL
EVA COMM **OFF** ■ EVA COMM
БРТА Close rubber cap covering potentiometers
Close protective cover of XWA3, XWA4 connectors
Comm cap ←|→ Orlan X3 connector
Stow comm cap in personal gear bag
Remove БРТА from Orlan
Install Orlan stowage cover onto Orlan and secure in attachment node
Stow jeweler's screwdriver in ISS tool kit

4.13. WATER SYSTEM CLEANING USING DEGASSING PUMP UNIT

4.13.1. DEGASSING PUMP UNIT (БОС) SETUP

(00:30:00)

1. Prepare ЗИП-1 and ЗИП-5 kits

БОС Remove cover
If degassing pump filter is dark, replace it:
| release filter from fastener;
| demate water connector;
| insert new filter onto degassing pump unit (√ **МСС-М** for serial number)
Install БОС-2 bag (from ЗИП-1 kit) on degassing pump unit degas fitting
√ ПИТАНИЕ — ВЫКЛ
√ Degassing pump filter water connectors (two) →|← inner degassing pump unit water connectors
ЗИП-5 kit Unstow 17КС.250Ю-8175А-30 electrical cable from
≠250Ю=А13-ШП connector →|← degassing pump unit electrical connector
≠10Ю=А339-Х1 connector →|← РБС 10/3

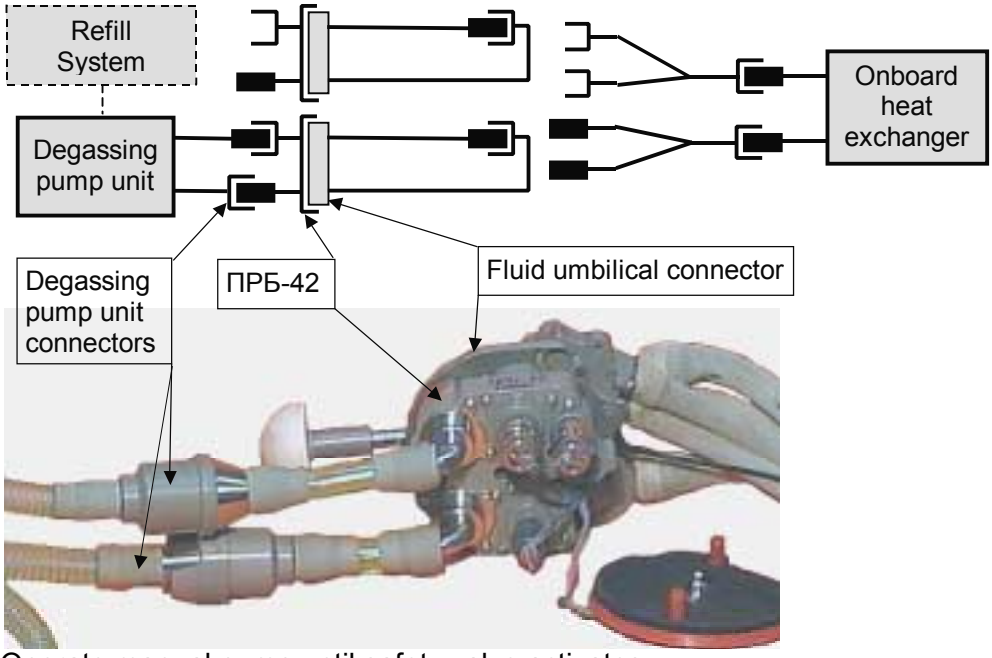
2. Perform Refill System Preparation per 2.3.1
Refill hose →|← fitting on degassing pump filter housing
safety valve √ Handle — ОТКР
Operate hand pump until safety valve activates

4.13.2. CLEANING AND SEPARATION OF БСС FLUID UMBILICAL

(00:30:00)

1. Perform Degassing Pump Unit (БОС) Setup (see 4.13.1)
   Prepare ЗИП-5 kit
2. БСС water hoses (four) ←|→ onboard heat exchanger tubes
   Mate together connectors of both БСС water hoses

ЗИП-5 kit Unstow ПРБ-42 accessories (two)
Remove red caps from ПРБ-42 accessories, stow caps in ЗИП-5 kit
ПРБ-42 accessories (two) →|← fluid umbilical connectors
Degassing pump unit water connectors →|← any ПРБ-42 accessory



Operate manual pump until safety valve activates

РБС 10/3 3. √ ON

БОС ПИТАНИЕ → ВКЛ
white pb Water flow rate > 1.5 L/min **********

****
ПИТАНИЕ → ВЫКЛ (for 5---10 sec)
ПИТАНИЕ → ВКЛ
Water flow rate > 1.5 L/min
****

Degassing pump filter is clear (if it is dark, replace)
When necessary remove gas bubbles from separator
water flow rate > 1.5 L/min
00:00:00 No gas bubbles are left in separator
00:03:00 ПИТАНИЕ → ВЫКЛ

4. Operate hand pump until safety valve activates
   Degassing pump unit ←|→ ПРБ-42
   Degassing pump unit →|← other ПРБ-42
   Repeat step 3

РБС 10/3 5. ⏚ OFF
Degassing pump unit ←|→ ПРБ-42
ПРБ-42 (two) ←|→ fluid umbilical connector
Red caps (ЗИП-5 kit) →|← ПРБ-42
Stow ПРБ-42 in ЗИП-5 kit
Disconnect fluid umbilical water connectors
БСС water hoses (four) →|← onboard heat exchanger tubes

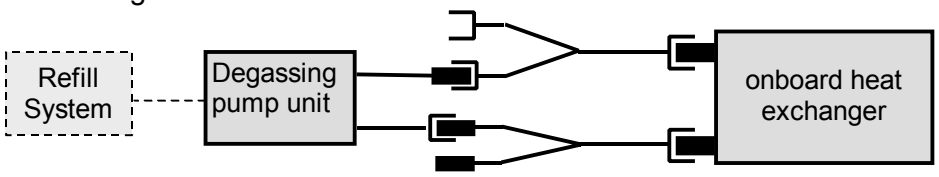
4.13.3. THERMOELECTRIC COOLING DEVICE CLEANING. LIQUID COOLING GARMENT AUTONOMOUS CLEANING

(00:30:00)

NOTE

Liquid cooling garment autonomous cleaning is performed according to the same procedure

1. Perform Degassing Pump Unit (БОС) Setup (see 4.13.1) and Refill System Preparation (see 2.3.1)
2. БСС water hoses (four) ←|→ onboard heat exchanger tubes
   Degassing pump unit water connectors →|← water connectors of onboard heat exchanger



Operate manual pump until safety valve activates

РБС 10/3 3. √⏻ ON
БОС ⏻ ПИТАНИЕ → ВКЛ
◁◁ Degassing pump filter is clear (if it is dark, replace)
When necessary remove gas bubbles from separator
◁◁ water flow rate > 1.5 L/min
00:00:00 ◁ No gas bubbles are left in separator
00:03:00 ⏚ ПИТАНИЕ → ВЫКЛ

4. Degassing pump unit connectors ←|→ water connectors of onboard heat exchanger
   Degassing pump unit connectors →|← water connectors of onboard heat exchanger
   Repeat step 3

РБС 10/3 5. ⏚ OFF
Operate hand pump until safety valve activates
Degassing pump unit ←|→ tubes of thermoelectric cooling device
БСС water hoses (four) →|← onboard heat exchanger tubes

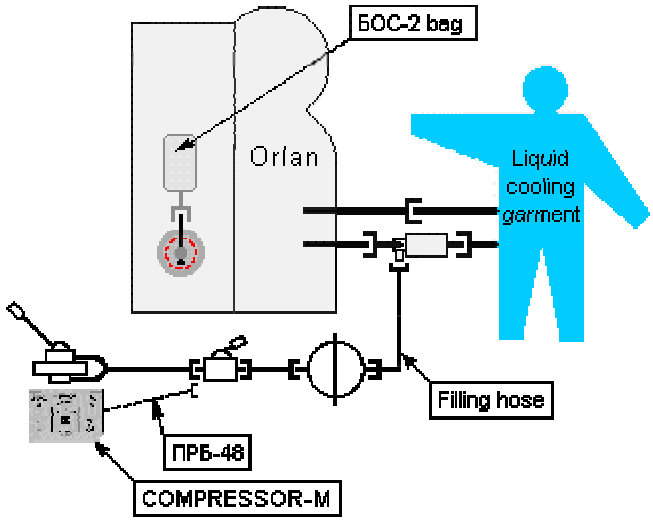
4.13.4. FINAL OPERATION

БОС-2 bag ←|→ degas fitting
Empty gas/water into АСУ
Stow empty bags into ЗИП-1 kit
17КС.250Ю-8175А-30 cable ←|→ degassing pump unit and РБС 10/3, stow cable in ЗИП-5 kit
Mate together degassing pump unit connectors
Cap degassing pump unit

4.14. CLEANING AND SEPARATION OF ORLAN WATER SYSTEM WITHOUT БСС

(01:00:00)

1. Perform Refill System Preparation per 2.3.1 and Orlan Preparation For Separation per 2.3.2



backpack 2. ◅ Water system refill indicator position — normal ********** 2.3.3
√ Filling hose ↔ degassing pump filter
ПГПУ √ ТО — ОТКЛ
√ temperature control handle — 6
ПОВ 3. ↓ PANEL ON (□ LED)
↓ SUIT 1(2) ON (□ LED)
ПО-4 √ ПИТАНИЕ — БОРТ ■ УТЕЧ, ИНЖ, ВЕНТ МАЛ, **ЗВУК**
O.НАС, Р.НАС
backpack ↓ ЗАМЕР РАСХОДА ◅ initial water flow rate =_____
Remove gas bubbles from separator (see 2.3.4 step 2)
◅◅ Degassing pump filter is clear (if it is dark — replace)
◅◅ water flow rate > 1.5 L/min **********

****
O.НАС, Р.НАС (for 5---10 sec)
O.НАС, Р.НАС
◅ water flow rate > 1.5 L/min
****

00:00:00 ◅ Gas bubble formation in separator has stopped
00:03:00 Temperature control handle → 0
When necessary remove gas bubbles from separator (see 2.3.4 step 2)
00:00:00 ◅ Gas bubble formation in separator has stopped
00:03:00 Temperature control handle → 6 (full down)
↓ ЗАМЕР РАСХОДА ◅ water flow rate =_____ > 1.5 L/min ********** see up
O.НАС, Р.НАС
Refill water system (see 2.3.3)

ПОВ 4. ↓ SUIT 1 (2) OFF (■ LED)
↓ PANEL OFF (■ LED)
ПО-4 ■ all annunciators
Remove БОС-2 bags from separator degas fittings, expel water from bags into АСУ
Stow empty bags in ЗИП-1 kit
Reinstall tubing restraint in backpack
Close backpack internal cover
Degassing pump filter ↔ Orlan and liquid cooling garment
Liquid cooling garment →|← Orlan
Stow liquid cooling garment in Orlan
Remove ПРБ-11 and stow in ЗИП-1 kit
Backpack tension line ring → onto hook
Disassemble refill system

4.15. БП-14 FUSE UNIT REPLACEMENT

Unstow new БП-14 fuse unit from ЗИП-3 kit
Unfasten multilayer insulation Velcro under ПО-4
Remove two screws fastening БП-14 fuse unit and remove the unit
Install new БП-14 fuse unit, tighten two screws
Fasten multilayer insulation Velcro under ПО-4
On MCC-M GO perform Orlan checkout

4.16. БСС AND FLUID UMBILICAL CHECKOUT

1. Prepare ЗИП-3, ЗИП-5 kits

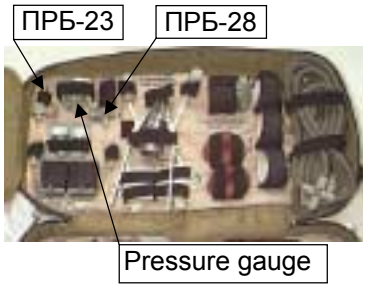
БСС √ Fluid umbilical →|← БСС correctly (marks and labels should match)
√ O_2 CLOSED

СК √ Fluid umbilical ↤↦ from Orlan
Open onboard БК-3 valve

00:00:00 2. O_2 OPEN-EVA ✪ O_2 OPEN
00:05:00 Close onboard БК-3 valve
00:10:00 ✪ O_2 OPEN

3. ПРБ-42 accessory (two from ЗИП-5 kit) →|← both fluid umbilical connectors
Open onboard БК-3 valve

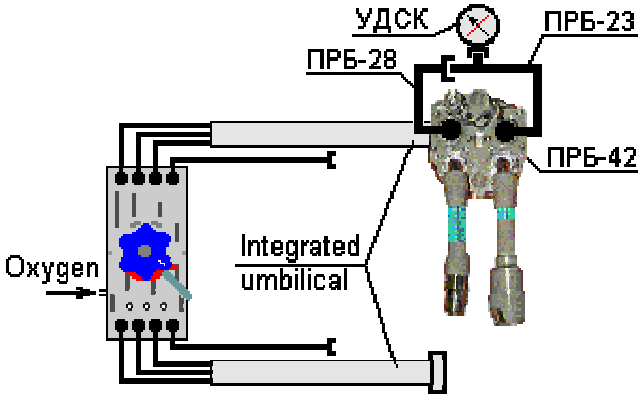
00:00:00 PRESS
00:05:00 Close onboard БК-3 valve
Prepare ПРБ-23, ПРБ-28 accessories and Orlan pressure gauge from ЗИП-3



00:10:00 ✪ O_2 OPEN

00:00:00 4. O_2 CLOSED
00:01:00 ✪ O_2 OPEN

5. ПРБ-42 (two) ↤↦ from both fluid umbilical connectors
ПРБ-42 + ПРБ-28 + ПРБ-23 accessories and Orlan pressure gauge →|← one of fluid umbilical connectors



6. Open onboard БК-3 valve
PRESS until oxygen pressure (by Orlan pressure gauge) = 0.5---0.6

00:00:00 LEAK CHECK
00:03:00 ◅ oxygen pressure (by Orlan pressure gauge) = 0.4---0.55
◅ Δ oxygen pressure (by Orlan pressure gauge) (00:01:00) ≤ 1 increment

00:00:00 7. PREBREATHE-A/L DEPRESS
00:05:00 ◅ oxygen pressure (by Orlan pressure gauge) = 0.35---0.37
Close onboard БК-3 valve
PURGE until oxygen pressure (by Orlan pressure gauge) = 0
O_2 CLOSED

5. USE OF ORLAN AUXILIARY EQUIPMENT

5.1. БК-3 OXYGEN BLEED

ПРБ-10 (from ЗИП-3 kit) →|← БК-3 oxygen fitting
Using special wrench from ЗИП-1 kit, open БК-3 valve
Bleed oxygen from БК-3 until hissing stops
Close БК-3 valve
ПРБ-10 ←|→ БК-3
Stow ПРБ 10 in ЗИП-3 kit

5.2. БК-3 CONNECTION TO OXYGEN EMERGENCY HOSE OF ORLAN

NOTE

Perform operation if it is necessary to increase Orlan autonomous O_2 supply

Prior to EVA

ПОВ Electrical connector A1X3KP →|← electrical connector of БК-3 pressure sensor
Adapter to pneumopanel hose (ЗИП-1 kit) →|← БК-3 bayonet connector
√ БК-3 pressure = 350---400 ********** use other БК-3
Temp stow БК-3 in A/L

During EVA in A/L

БК-3 (via adapter to pneumopanel hose) →|← emergency hose on Orlan
Using special wrench, open БК-3 valve
While moving, secure БК-3 (either holding by hand or by tethering)
ПО-4 If □ O_2 МАЛО
ПГПУ БАЛЛОН → РЕЗ

5.3. ORLAN FEEDWATER BLADDER REFILL FROM ANOTHER ORLAN FEEDWATER BLADDER

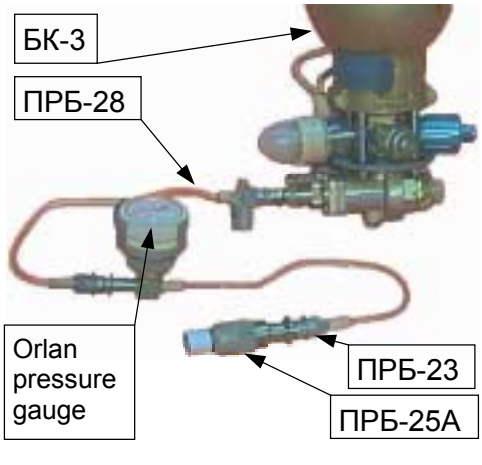
Unclasp straps and unfasten long zipper on Orlan feedwater bladder restraint
√ Feedwater bladder shell is straightened
Fasten long zipper and clasp straps
Unfasten short zipper
Unstow from ЗИП-5 kit ПРБ-16 and ПРБ-13 accessory
ПРБ-16 →|← Orlan feedwater bladder and donor feedwater bladder
Insert donor feedwater bladder strap into ПРБ-13 slot

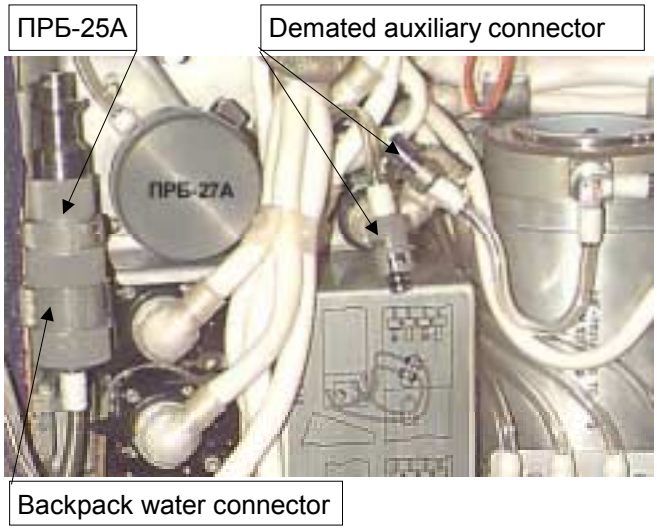
Squeeze donor feedwater bladder (by rolling it up on ПРБ-13) to refill Orlan feedwater bladder
◅ Water volume in Orlan bladder increases (visually and by touch)
After refill is complete, ПРБ-16 ←|→ feedwater bladders
Stow ПРБ-16 and ПРБ-13 accessory in ЗИП-5 kit

5.4. WATER SUPPLY LINE PURGE

5.4.1. PURGING LINES FROM FEEDWATER BLADDER TO HEAT EXCHANGER

1. Assemble circuit:
   Unstow from ЗИП-3 kit ПРБ-28, ПРБ-23, ПРБ-25А, ПРБ-27А
   БК-3 (√ **МСС-М** for serial nuber) →|← ПРБ-28
   ПРБ-28 →|← ПРБ-23
   Orlan pressure gauge ←|→ Orlan
   Orlan pressure gauge →|← ПРБ-23
   ПРБ-23 →|← ПРБ-25А
   ПРБ-25А →|← backpack water connector
2. ПРБ-27А →|← feedwater line filter socket
   Demate auxiliary connector between feedwater line filter and sublimator (secured in lirka clip above measurement unit)





ПГПУ

3. √ БАЛЛОН — РЕЗ
   √ O_2 flow selector — ОТКЛ
   √ ТО — ОТКЛ
   Using special wrench (from ЗИП-1 kit), open reserve БК-3 valve
   Sublimator → On
   Open БК-3 valve (in the assembled circuit)
   ◅ oxygen pressure (by Orlan pressure gauge) < 0.45

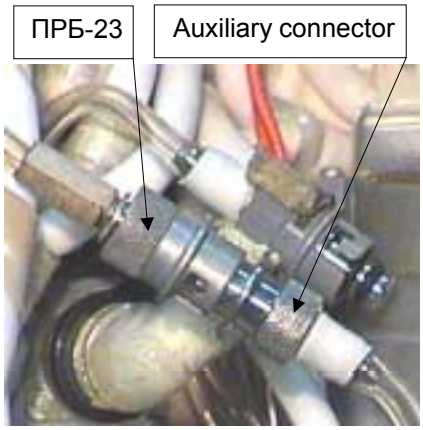
****
****
Close БК-3 valve
Report to МСС-М
****

   Oxygen supply from demated auxiliary connector
4. Close valves of both БК-3

ПГПУ

   Sublimator → Off
   O_2 flow selector → ИНЖ
   If operations per 5.4.2, 5.4.3 are not required by **МСС-М:**
   | Disassemble circuit
   | Mate auxiliary connector
   | Install auxiliary connector into lirka clip
   | √ **Auxiliary** connector **(after feedwater line filter) is mated**

5.4.2. PURGING LINES FROM FEEDWATER LINE FILTER TO SUBLIMATOR

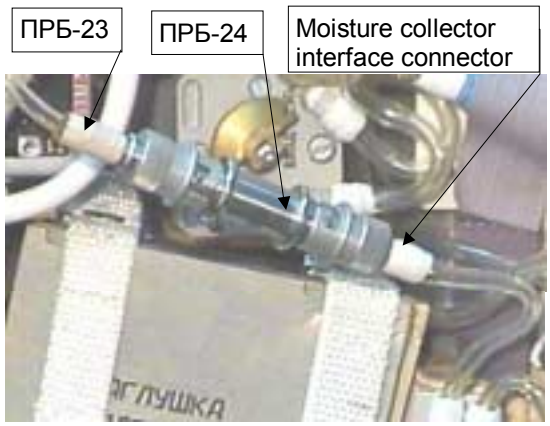


1. In the circuit, assembled per 5.4.1:
   ПРБ-25А ↔ ПРБ-23
   ПРБ-23 →|← demated auxiliary connector on the side of sublimator

00:00:00 2. Open БК-3 valve (in the assembled circuit)
◅ Orlan pressure gauge reading < 0.45
If pressure ≥ 0.45 or safety valve activates on ПРБ-28
| Close БК-3
| **Report to MCC-M**

00:01:00 3. ◅ Orlan pressure gauge reading < 0.1
Close БК-3 valve (in the assembled circuit)
Mate auxiliary connector
Install mated auxiliary connector into lirka clip
If operations per 5.4.3 are not required by **MCC-M**
| Disassemble circuit
| √ **Auxiliary connector (after feedwater line filter) is mated**

5.4.3. MOISTURE COLLECTOR TO SUBLIMATOR LINE PURGE

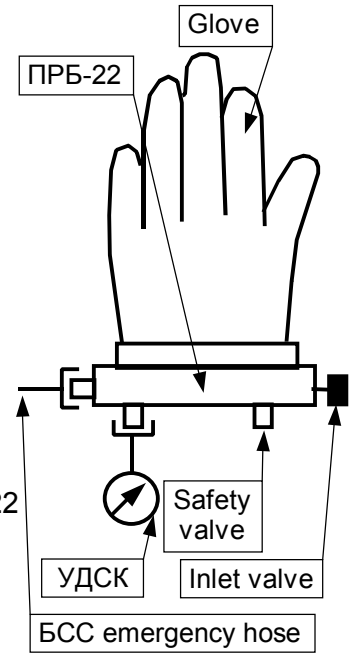


1. In the circuit assembled per 5.4.2:
   ПРБ-24 (from ЗИП-3 kit) →|← ПРБ-23
   ПРБ-24 →|← moisture collector interface connector

00:00:00 2. Open БК-3 valve (in the assembled circuit)
◅ Orlan pressure gauge reading < 0.45
If pressure ≥ 0.45 or safety valve activates on ПРБ-28
| Close БК-3
| **Report to MCC-M**

00:01:00 3. ◅ Orlan pressure gauge reading < 0.1
Close БК-3 valve (in the assembled circuit)
Disassemble circuit
Mate auxiliary connector
Stow all accessories in ЗИП-3 kit
Orlan pressure gauge →|← Orlan
√ **Auxiliary connector (after feedwater line filter) is mated**

5.5. GLOVE LEAK CHECK



1. Unstow Orlan pressure gauge from Orlan
   Assemble circuit:
   Orlan pressure gauge →|← ПРБ-22 (from ЗИП-1 kit)
   ПРБ-22 →|← emergency hose
   Glove →|← ПРБ-22

БСС
√ БК-3 (pressure > 50) is connected to БСС
√ Metal caps are installed on all free connectors of БСС tube
O2 CLOSED
Using special wrench, open БК-3 valve
O2 OPEN-EVA O2 OPEN

ПРБ-22 2. Press to open inlet valve until glove pressure (by Orlan pressure gauge) = 0.4
If glove pressure > 0.5 or safety valve activates on ПРБ-22

БСС
O2 CLOSED
√**MCC-M**

00:00:00 ◅ glove pressure (by Orlan pressure gauge) = 0.4
00:01:00 ◅ glove pressure (by Orlan pressure gauge) ≥ 0.38
◅ Δ glove pressure (over 00:01:00) < 2.5 increments (use red arrow), **report to MCC-M**

ПРБ-22 3. Depressurize glove, pulling aside safety valve cord
Glove ←|→ ПРБ-22
Other glove →|← ПРБ-22
Perform step 2
Using special wrench, close БК-3 valve

БСС 4. PURGE O2 OPEN
O2 CLOSED
Disassemble circuit
Install rubber cap on free БСС oxygen tube connector
Orlan pressure gauge →|← Orlan

5.6. FINAL DRYING OF GLOVES

1. Assemble circuit:
   ПРБ-31 (from ЗИП-6 kit) →|← ПРБ-37 (from ЗИП-6 kit)
   ПРБ-37 →|← gloves final drying accessory (Sokol kit)
   Open Orlan backpack
   ПРБ-31 →|← valve cover in backpack
   Install glove onto final drying accessory (from Sokol kit)

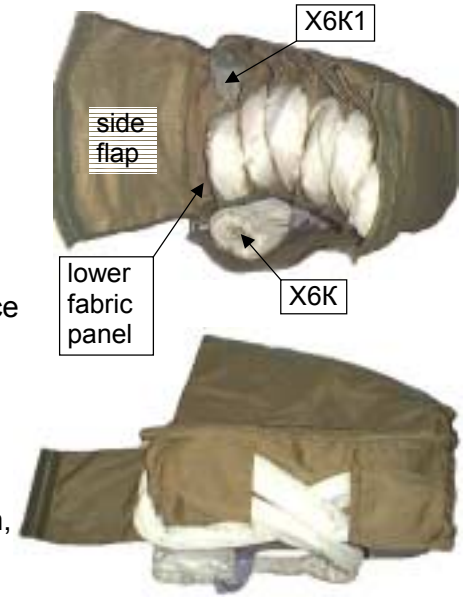
ПО-4 2. √ О.НАС, Р.НАС, О.ВЕНТ, Р.ВЕНТ, ПИТАНИЕ — БОРТ
√ Electrical umbilical →|← Orlan

ПОВ
↓ PANEL ON (□ LED)
↓ SUIT 1 (2) ON (□ LED)

ПО-4
00:00:00 3. Р.ВЕНТ
00:30:00 Р.ВЕНТ

ПОВ
↓ SUIT 1 (2) OFF (■ LED)
↓ PANEL OFF (■ LED)

5.7. 25 M ELECTRICAL UMBILICAL SETUP



1. Demate X6K1 connector of 3 m electrical umbilical
2. Secure kit with 25 m electrical umbilical in A/L
   Open side flap of kit
   Undo metal zipper
   Open lower fabric panel Velcro located under metal zipper
   Unstow X6K1 male connector. X6K1 →|← X6K1 female connector of 3 m umbilical
3. Open fabric panel #1 Velcro
   Sequentially unstow coils (three) of 25 m umbilical and place them on top of panel pockets
   Close fabric panel Velcro
   √ umbilical restraint free from Velcro
4. Repeat step 3 the required number of times based on specific EVA task (required length)
5. After umbilical X6K connector has been connected to Orlan, close metal zipper on kit
   Prior to EVA, undo metal zipper on kit

6. After EVA, coil umbilical and stow coils in panel pockets in the reverse order
   Do not bend umbilical excessively when making coils
   Close metal zipper on kit and side flap

5.8. USE OF ORLAN AS DECOMPRESSION CHAMBER

After appearance of symptoms of decompression disease during EVA:
Immediately return to A/L, avoiding physical strain
Able crewmember provides assistance to affected crewmember

WARNING

Able crewmember is not allowed to open Orlan backpack until fluid umbilical is demated to avoid Orlan depressurization of affected crewmember

When repress of A/L is complete, able crewmember demates fluid umbilical from Orlan and only then exits Orlan

Affected crewmember remains in Orlan (connected to onboard supply)

On MCC-M GO

БСС PRESS to Orlan pressure = 0.2---0.4
O_2 OPEN-EVA

WARNING

Total time of stay in Orlan should not exceed 9 hours (after donning Orlan)
If time needs to be increased, √ **MCC-M** (replace LiOH canister, БК-3 and other consummables)

Transfer to ПхО

ПОВ
Activate thermoelectrical cooling device

backpack
Install new LiOH canister in Orlan
√ Moisture collector is installed
√ Feedwater line filter is installed (any)
Measurement unit tubes → РАБОТА configuration (per decal)

БСС
√ БК-3 with total pressure ≥ 400 are connected to БСС
Open valves of onboard БК-3
√ Fluid umbilical is mated only to affected crewmember's Orlan
Affected crewmember dons liquid cooling garment and comm cap
Don Orlan

ПО-4
О.ВЕНТ, О.НАС
Perform Orlan purge from БСС for 4 minutes
О.ВЕНТ, О.НАС

5.9. NASA EVA GEAR

5.9.1. WATER DRINKING BAG

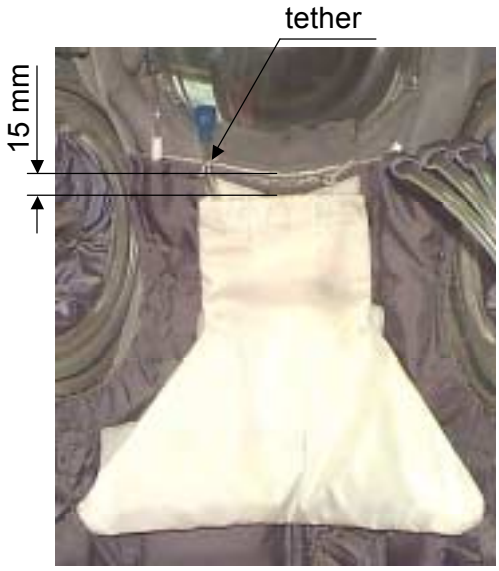
1. DRINKING BAG SETUP
   Unstow the bag from storage location
   Open Velcro clip on the bag soft cover and take the bag out
   ◅ bag, tube and mouthpiece are not damaged
   If there is air in bag (bag is slightly inflated)
   | Place bag on a flat surface
   | Compress mouthpiece and open drinking valve
   | Flatten bag by hand to expel excess air through drinking valve

2. DRINKING BAG REFILLING

pnl 230 √ Dispenser hose →|← ЕДВ
√ Individual mouthpiece ↤↦ dispenser mouthpiece adapter
Insert dispenser cone through mouthpiece in drinking **tube**
Safety valve handle → ОТКР
Operate hand pump until safety valve activates (👂)
Dispenser coupling → drinking position

00:00:00 ↓ pb on dispenser and hold
Perform 2-3 pumping cycles using manual pump
00:00:20 Release pb on dispenser
◅ there is ~ 500 mL water in bag
Dispenser coupling → initial position
Pull out dispenser cone from drinking bag mouthpiece
Place the bag into soft cover, insert straps of soft cover into slots of bag and secure
Close Velcro clip

3. DRINKING BAG INSTALLATION INTO ORLAN
   Secure soft cover with bag inside on Orlan liner using Velcro (see Figure)
   Tether drinking tube to Orlan liner-to-cuirass attachment cord, using ШКП cord from ЗИП-3 kit



4. DRINKING BAG REMOVAL FROM ORLAN
   Untether drinking tube from Orlan liner-to-cuirass attachment cord
   Soft cover with bag ↤↦ Orlan liner
   Remove bag from Orlan and stow in storage location

5.9.2. FRESNEL LENS

1. LENS PREPARATION
   Unstow lens from storage location
   ◅ lens surface is clean (no visible specs of dust or dirt)
   If necessary, clean up the lens using the wipes from ЗИП-1 kit,
   (first, the one moistened with potable water, and then a dry one)
2. HELMET GLASS COVER PREPARATION
   ◅ absence of grease, dust or dirt on the inside of helmet glass cover ,
   If necessary, clean up the glass cover using either the shammy from ЗИП-1 kit
   or the wipes from Orlan-M ORU kit (first, the one moistened with
   potable water, and then a dry one)
3. LENS INSTALLATION
   Install the lens on the bottom right portion of the inside of the helmet glass cover
   so that the ПО-4 upper panel was clearly visible through the lens
   Smooth out the lens using the shammy from ЗИП-1 kit
   ◅ absence of air bubbles between the lens and the helmet glass cover
   Lubricate internal surface of the helmet glass cover, **except for the lens**,
   using special grease from ЗИП-1 kit
4. LENS REMOVAL
   Holding the lens by its corner, carefully separate it from the helmet glass cover
   ◅ lens surface is clean (no visible specs of dust or dirt)
   Stow lens in storage location

5.9.3. HYGIENIC BRIEFS

1. Unstow briefs from storage location
   ◅ absorbent layer is not damaged
2. Prior to donning other EVA gear:
   firmly press the front and rear parts of the briefs to the waist
   engage side clasps
   √ clasps hold reliably
   If clasps do not hold - take another pair of briefs
3. After usage, stow the briefs in the wet waste container

5.9.4. HYGIENIC UNDERGLOVES FOR EVA GLOVES

1. Unstow pack with undergloves from storage location

> NOTE
> Medium-sized undergloves have orange trim
> Larger-sized undergloves have red trim

2. Don undergloves after donning EVA overalls
3. After EVA is complete, dry out the undergloves and stow them in storage location

5.9.5. MOLESKIN TAPE

1. Unstow moleskin tape from storage location
   Unstow a pair of scissors from the ISS Toolkit
2. At EV crewmember preference, cut several pieces of moleskin tape for protection of his/her palms and wrists during EVA operations
3. Prior to donning EVA undergloves:
   remove protective film from cut pieces of moleskin tape,
   apply pieces of tape on the parts of hand and wrist to be protected against lesions,
   press tape firmly, smoothing it out
4. After EVA is complete, remove moleskn tape from skin and discard

5.9.6. SOCKS

1. Unstow a pack of thin white socks and warm thick red-black socks

Sock Sizes	
S	39-42
M	42-45
L	45-48

2. Don regular socks prior to donning EVA overalls
   After donning the liquid cooling garment, remove overalls straps from feet and don warm socks